DOCUMENT RESUME

ED 401 900 IR 056 143

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TITLE Sailor: Maryland's Online Public Information Network. Sailor Network Assessment Final Report: Findings and Future Sailor Network Development.
INSTITUTION Maryland State Dept. of Education, Baltimore. Div. of Library Development and Services.
PUB DATE 1 Sep 96
NOTE 116p.; For companion report containing detailed data collection and study findings, "Sailor Network Assessment Final Report Compendium," see IR 056 144.
AVAILABLE FROM Division of Library and Development Services, Maryland State Department of Education, 200 W. Baltimore St., Baltimore, MD 21201-2595.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS Community; Computer Mediated Communication; *Computer Networks; Futures (of Society); Information Networks; *Internet; Measurement; Online Systems; Program Evaluation; *Public Libraries; State Government; *State Programs; User Needs (Information); Use Studies
IDENTIFIERS Maryland; *Sailor Online Public Information Network MD

ABSTRACT

This report describes the results of an assessment of Sailor, Maryland's Online Public Information Network, which provides statewide Internet connection to 100% of Maryland public libraries. The concept of a "statewide networked environment" includes information services, products, hardware and software, telecommunications infrastructure, and resources that users and providers of the statewide network receive via the network. The statewide networked environment comprises both state networks and locally developed information services, and serves as a gateway to national and international information services. The purpose of the assessment was to: (1) evaluate the value of the Sailor network to such target communities as the public library, K-12, business, minority, and state and local government communities; (2) recommend refinements and modifications to the Sailor network to meet the needs of the target communities; (3) measure the nature and extent of target community use of the Sailor network; and (4) create measurement devices that the Division of Library Development and Services (DLDS) can use in the future to assess the Sailor network. This report details key findings, future Sailor development models, and provides recommendations. Appendices include: Seymour Plan Vision Statement; Sailor Network Funding Expenditures Summary and Governance Board Membership; The Piper Letter: Making Sense of Web Usage Statistics; and Sailor Operations Center Fiscal Year 1996 Annual Report. (Contains 12 references.) (SWC)

ED 401 900

Sailor Network Assessment Final Report: Findings and Future Sailor Network Development

SAILOR®

Maryland's Online Public Information Network

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September 1, 1996

Prepared for:

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Funding for this project is provided by Library Services and Construction Act.

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ACKNOWLEDGMENTS

Many people contributed to the successful completion of this project. First and foremost are the people who participated in the focus groups, who answered surveys, who made themselves available for interviews, and who provided other types of information regarding the Sailor network. The participants included librarians, teachers and school officials, local and state government officials, members of the private sector, and others. We would like to particularly thank our case site liaisons -- Que Bronson, Montgomery County Public Library; Irene Padilla, Harford County Public Library; Kathleen Reif, Wicomico County Public Library; and, Pat Wallace, Enoch Pratt Free Library -- for their tremendous help in coordinating, contacting, and organizing our case site meetings. Were it not for their participation in the project we would not have obtained the excellent information they provided. Nor would we have been able to test, develop, and refine the various data collection instruments. So... to the liaisons and participants, we greatly appreciate your help and involvement.

We also acknowledge the involvement and help from the Advisory Committee that included: Trudi Bellardo Hahn, University of Maryland Libraries, College Park; Pat Hofmann, Calvert County Public Library; Ingrid Yei-Hsieh, School of Library and Information Science, Catholic University; Paula Montgomery, School Library Media Consultant; Danuta Nitechi, University of Maryland Libraries, College Park; and Irene Padilla, Harford County Public Library. These individuals provided a range of assistance to the project that included the review of project documents, pretesting data collection instruments, meeting with the consultants, helping to schedule meetings and interviews with others, and otherwise helping to complete the project. Thanks!

A special nod of thanks goes to Suzanne Eastham, research assistant for the first portion of the project. Suzanne helped us conduct a number of the focus group sessions, was actively involved in a number of other data collection and analysis activities, and participated in the various meetings. Her assistance was invaluable and contributed directly to the overall success of the project.

Within the Division of Library Development and Services (DLDS), we especially acknowledge the help of Rivkah K. Sass, Barbara G. Smith, Denise Davis, Stacey Aldrich, and Sandy Stafford. Prior to her move to the University of Maryland College Park, Trudi Belardo Hahn also assisted the consultants in the assessment project as a DLDS staff member. Their involvement and assistance throughout the project was critically important. Their work, advice, suggestions, and review or key documents and data collection activities greatly improved the overall project products. We also want to thank Maurice Travillion, the State Librarian, for his support of this project.

Also important to one key aspect of the project were Pat Wallace, Agnes Tatarka, Stuart Ragland, Russell Doyen, and Larry Owens of the Sailor Operations Center at Enoch Pratt Free library. These individuals contributed much time and effort in collecting data, and assisting the consultants produce statistics related to a range of network activities. We especially appreciate the

work and assistance from Russell Doyen for his work on capturing information from various log files and organizing them for our analysis.

Finally, we wish to express our gratitude to the staff of the University of Maryland Baltimore County's Maryland Institute for Policy Analysis and Research -- Donald F. Norris, Linda Brown, and Deborah Meehan -- for their tremendous administrative and research assistance in producing this report.

Although many people contributed to the project, the content and specifically, the recommendations offered in this report are the responsibility of the consultants. We hope that both the final report and the final report *Compendium* will assist in the ongoing growth and development of Sailor. We also hope that these two documents will be of interest to others building statement networks who are considering options and strategies for assessing those networks.

John Carlo Bertot
Charles R. McClure
September 1, 1996

TABLE OF CONTENTS

INTRODUCTION 1
The Statewide Electronic Network Environment 1
The Maryland Statewide Network Environment 3
Measurement and Evaluation 3

STUDY METHODOLOGY 5
Measurement Issues 9
Distributed Network Environment 9
Management Information Systems (MIS) 9
Precision of Measurement 10
Inventing New Methods and Instruments 11
Obtaining Webmeister Cooperation 11
Defining the Sailor Network 12
Contending with the Measurement Issues 12

THE BEGINNING OF THE SAILOR NETWORK 13

SAILOR NETWORK USAGE STATISTICS 24

KEY FINDINGS 41
Governance Issues 41
New Governing Board 42
Purpose of the Sailor Network 43
Cost Effectiveness of Sailor 44
Funding Sailor 44
Role of Enoch Pratt Free Library (EPFL) 45
Physical Infrastructure Issues 46
Responding to Unrealistic Expectations 48
Sailor Content and Services Issues 48
Sailor as Maryland's Community Network 48
Centralized Versus Decentralized Content/Services 48
Comparing Sailor to Other State Library Networks 49
Training and Support 53
Updating the Skills of Organization Personnel 53
Providing Training to Community Organizations 54
Instituting Continual Improvement Training Sessions 56
Benefits from the Sailor Network 56
Overview 57

DEVELOPING A VISION FOR SAILOR 58

FUTURE SAILOR DEVELOPMENT MODELS 59
The Local Partnership Model 59
The Outsourcing Sailor Model 60
The Executive Branch Model 60
The Declare Victory Model 60
The Hybrid Model 61

The Public Broadcasting System (PBS) Model 61
The Status Quo Model 61

RECOMMENDATIONS 64
Governance 64
Management 65
Vision and Goals 67
Funding 68
Community Based Services and Programs 69
Development of Network Content 70
Tiered Networked Services Provision 71
Technology Infrastructure 72
The Visiting Sailor Officer (VSO) 73
Training 74
Management Information Systems (MIS) Development 75
Financial Information 76
Marketing and Publicity 77
Communication 78

CREATING SAILOR'S FUTURE 79

REFERENCES 81

Appendix A - Seymour Plan Vision Statement 82

Appendix B - Sailor Network Funding Expenditures Summary 83

Appendix C - Sailor Network Governance Board Membership 85

Appendix D - The Piper Latter: Making Sense of Web Usage Statistics 86

Appendix E - Sailor Operations Center FY 1996 Annual Report 100

INTRODUCTION

The Division of Library Development and Services (DLDS) contracted with the study team of John Carlo Bertot, Charles R. McClure, and Suzanne Eastham in the fall of 1995 to assess the Sailor network. The purpose of the assessment was to:

- Evaluate the value of the Sailor network to such target communities as the public library, K-12, business, minority, and state and local government communities;
- Recommend refinements and modifications to the Sailor network to meet the needs of the target communities;
- Measure the nature and extent of target community use of the Sailor network, with emphasis on the incorporation of Sailor network-based resources into community activities; and,
- Create measurement devices that DLDS can use in the future to maintain ongoing or periodic assessment of the Sailor network.

The assessment, therefore, focused on the present use and future directions of Sailor.

This final report is a summary version of the study findings. The final report *Compendium* contains the detailed study findings, study data collection activity write-ups, detailed methodologies, data collection tools, and consultant notes on the uses of the study's data collection instruments. Readers interested in the details of the study's data collection activities should consult the final report *Compendium*. Together, the final report and the final report compendium demonstrate two different purposes: (1) the final report presents specific issues and findings pertaining to the Sailor network; and, (2) the final report *Compendium* presents tools for DLDS and Sailor-connected organizations to perform continued Sailor evaluation activities, but may also serve to provide other statewide electronic network evaluators with a set of tools to assist them in their state network evaluation activities.

The Statewide Electronic Network Environment

The notion of the "statewide networked environment" encompasses a range of electronic networked activities and services. Minimally, the statewide networked environment includes information services, products, hardware and software, telecommunications infrastructure, and resources that users and providers of the statewide network receive via the network. In this environment, state networks provide information services, although locally developed information services (e.g., local government, school districts, public libraries) also comprise the statewide networked environment. In addition, such networks serve as gateways to national and international information services. Both the networking of users and resources within the state as well the connecting of these users to other persons and resources outside of the state are considered part of this environment.

The concept of networked information services is an evolving one. Such services can be offered by individuals, libraries, computer centers, publishers, networks, government agencies, or a host of other organizations and groups with access to the Internet and the evolving National Information Infrastructure (NII) (Huth and Gould, 1994) and the Global Information Infrastructure (GII) (Gore, 1995). Networked information services comprise bulletin boards; e-mail; listservs; remote access to distant databases, software, and high speed computing; and, can support collaborative efforts among geographically dispersed individuals--to name but a few network-enabling capabilities. Key aspects of "networked information services" are that:

- There are numerous information providers connected by a statewide network at the state and local levels.
- There are a range of electronic information services available to users.
- Access to and use of these services continues to increase.
- Technological advances create an extremely fluid and rapidly changing networked environment.

Despite the fact that many state governments have built significant networks and are connected to the Internet and the evolving GII and NII, there is little knowledge of how such connectivity affects the state in such socio-economic terms as enhanced citizen productivity, education, employment, and creating a more cost effective and efficient exchange between government and citizens, to name a few key issue areas.

There is evidence that a restructuring of the computing and communications infrastructure as a result of the availability and use of electronic information is occurring and that this will have a fundamental impact on government institutions. Already, this restructuring is affecting the communication customs and expectations of researchers in a variety of fields. In a larger sense, this restructuring is affecting the entire information transfer cycle from the creation, structuring, and representation of information to its dissemination and use by the members of various communities (McClure, 1993).

Traditional criteria used in assessing information services, e.g., extensiveness, efficiency, effectiveness, impact, service quality, and usefulness, may serve as a beginning model for networked information services assessment. Working with these, and other criteria, McClure and Lopata (1996) have developed a manual that describes qualitative and quantitative techniques -- as well as offering a example user survey -- for assessing an academic networked environment. In addition, CAUSE, an association for managing and using information resources in higher education, published an excellent tool, *Self-Assessment for Campus Information Technology Services* (Fleit, 1994) as well as *Evaluation Guidelines for Institutional Information Resources* (CAUSE, 1995). These assessment tools can serve as a beginning point for those in the process of assessing the statewide networked environment.

The Maryland Statewide Network Environment

The state of Maryland is on the forefront of providing statewide public access to the Internet. Since the beginning implementation of the Sailor network in 1993, DLDS began the innovative, challenging, and nationally unprecedented task of connecting the entire state to the Internet through public libraries (McClure, Bertot, and Beachboard, 1995). The goal to provide free, local, and instant access to electronic networked information resources pushed Maryland to the forefront of public librarianship.

Today, Maryland is far ahead of the rest of the nation in terms of public library Internet connectivity. At present, 44.6% of the nation's public libraries are connected to the Internet in some way (Bertot, McClure, and Zweizig, 1996). Regionally, 39.0% of public libraries in the South (a census-based category into which Maryland falls) have Internet connections. In Maryland, 100.0% of public libraries now have an Internet connection through the Sailor network.

Through creativity, DLDS-public library collaboration, and an entrepreneurial spirit, Maryland is now in a position that far exceeds the current state of the nation in terms of Internet connectivity. Indeed, while the rest of the nation's public libraries contend with issues of establishing Internet connections, Maryland, through the Sailor network, is entering a new era of electronic content and service development. This will once again place Maryland on the frontier of statewide electronic networking.

With the completion of the Sailor network backbone, and prior to moving fully into electronic content and service development, DLDS recognized the need for an evaluation of the Sailor network. Such an evaluation would serve to guide the future development of the Sailor network as Sailor enters the era of content and service initiatives, and provide a basis for future Sailor network activity measurement and evaluation.

Measurement and Evaluation

Performance measures represent a broad managerial/evaluation concept that encompasses measurement of inputs (indicators of the resources essential to provide a service), outputs (indicators of the services resulting from the use of those resources), and impacts (the affect of these outcomes on other variables or factors). They are an essential means to assess the statewide networked environment. Performance measures serve a number of useful purposes. They can:

- Identify those aspects of the network that are successful versus those aspects that are less successful.
- Provide trend-data to assess changes in the network and network services over time.
- Assist decision makers to allocate or reallocate resources needed to plan for future network development.

- Monitor network activities and services to inform managers of any changes in activities or the quality of services.

- Determine the degree to which users are satisfied with the network and network services.

- Assist network managers to justify expenditures and be accountable for those expenditures.

Performance measures, then, ask decision makers to answer the question: How well is the service or activity doing what it claims to be doing?

Performance measures can also assist managers to formally evaluate the network. Thus, evaluation is the process of identifying and collecting data about specific services or activities, establishing criteria to assess their success, and determining the degree to which the service or activity accomplishes stated objectives. Evaluation, therefore, is a decision making tool intended primarily to assist decision makers allocate resources that best accomplish organizational goals. Evaluation reflects value judgements on the part of the evaluator regarding the adequacy, appropriateness, and success of a particular service or activity.

In a broader organizational context, measurement and evaluation of networked information services are essential for resource allocation, planning, and improving services. Without measures that can evaluate particular services, decision makers must rely on intuition and anecdotal information as a basis for assessing the usefulness and value of a particular service. Perhaps most importantly, measurement and evaluation provide feedback opportunities for users to make known the extent to which those services meet their needs.

Approaches for evaluating networked information services can be based on the following criteria:

- Extensiveness: how much of the service has been provided, e.g., number of users logging-in per week on a bulletin board, or the number of participants of a particular listserv.

- Efficiency: the use of resources in providing or accessing networked information services, e.g., cost per session in providing access to remote users of an on-line catalog, or average time required to successfully telnet to a remote database.

- Effectiveness: how well the networked information service met the objectives of the provider or the user, e.g., success rate of identifying and accessing the information needed by the user.

- Service quality: how well a service or activity is done, e.g., percentage of transactions where users acquire the information they need.

- Impact: how a service made a difference in some other activity or situation, e.g., the degree to which network users enhanced their ability to gain employment or pursue business.

- Usefulness: this is a measure of appropriateness, that is, the degree to which the services are useful or appropriate for the individual user, e.g., percentage of services of interest to different types of user audiences.

Although evaluations of networked information services need to consider extensiveness and efficiency criteria, this study focused primarily on effectiveness, service quality, usefulness, and impact measures. Developing measures of impacts from networked services, however, remains a very difficult task.

Providers of networked information services must not accept as a "given" that their services, resources, and technical procedures are efficient and effective. Ongoing evaluation activities are essential to support the provider's planning process. Planning and evaluation are two sides of the same coin. Each will be more successful when the other is part of the overall services design and implementation approach.

Developing, operationalizing, and validating a range of performance measures that encourage electronic network service providers to assess what types of networked information services have what level of quality, impacts on the network users, and costs is essential if administrators of networked information in the electronic network setting are to justify such services and better meet user information needs.

STUDY METHODOLOGY

The assessment team engaged in a number of data collection activities between October 1, 1995 and June 1, 1996 to derive the findings presented in this report. These activities included:

- Case studies of the five[1] Maryland library systems that included focus groups and interviews with site

  - Public library administrators and librarians,
  - Local and state government officials,
  - Higher education faculty and administrators,
  - K-12 teachers and administrators,
  - Local business leaders,
  - Members of the press/media, and
  - Internet Service Providers (ISPs);

---

[1]The initial Sailor assessment plan included a four site demographically- and regionally-based case study approach that included Baltimore City, Harford County, Montgomery County, and Wicomico County. The assessment team added Garrett County to the original case site selection to gain a Western Maryland perspective on Sailor.

- Mail and quick response surveys with
  - School library media specialists in selected case sites,
  - Sailor Master Trainers, and
  - The Maryland Association of Public Library Administrators (MAPLA);
- Focus groups and interviews with key Sailor entities, including
  - DLDS,
  - Sailor Operations,
  - Network Navigators,
  - Network Coordination Council, and
  - MAPLA;
- Preliminary study result presentations with the Advisory Committee and at the May 8, 1996 Maryland Library Association annual meeting;
- Sailor network traffic data collection for the month of March, 1996, including
  - Overall Sailor usage,
  - Help desk transactions, and
  - Case site Ascend router traffic;[2]
- Sailor Web page assessment in comparison to five other statewide state library-run network Web pages;
- Content analysis of case site, DLDS, and Sailor Operations Sailor-related planning, training, and manual documentation; and,
- Pre-testing data collection instruments, continual consultation with, and presentations to the Sailor network assessment Advisory Committee, DLDS, and the Maryland Library Association.

Together, these data collection activities provided the assessment team with the ability to identify both general and specific Sailor network operation, management, and technical issues (see Figure 1). In all, the study team conducted 10 focus groups and 23 in-person and/or telephone interviews that included over 125 individuals from the Sailor-related communities identified above (see Figure 2). Specific details of each data collection activity is available in the final report *Compendium*.

Throughout the data collection component of this study, a number of factors affected the ability of the study team to collect assessment data. Several of these factors are identified below.

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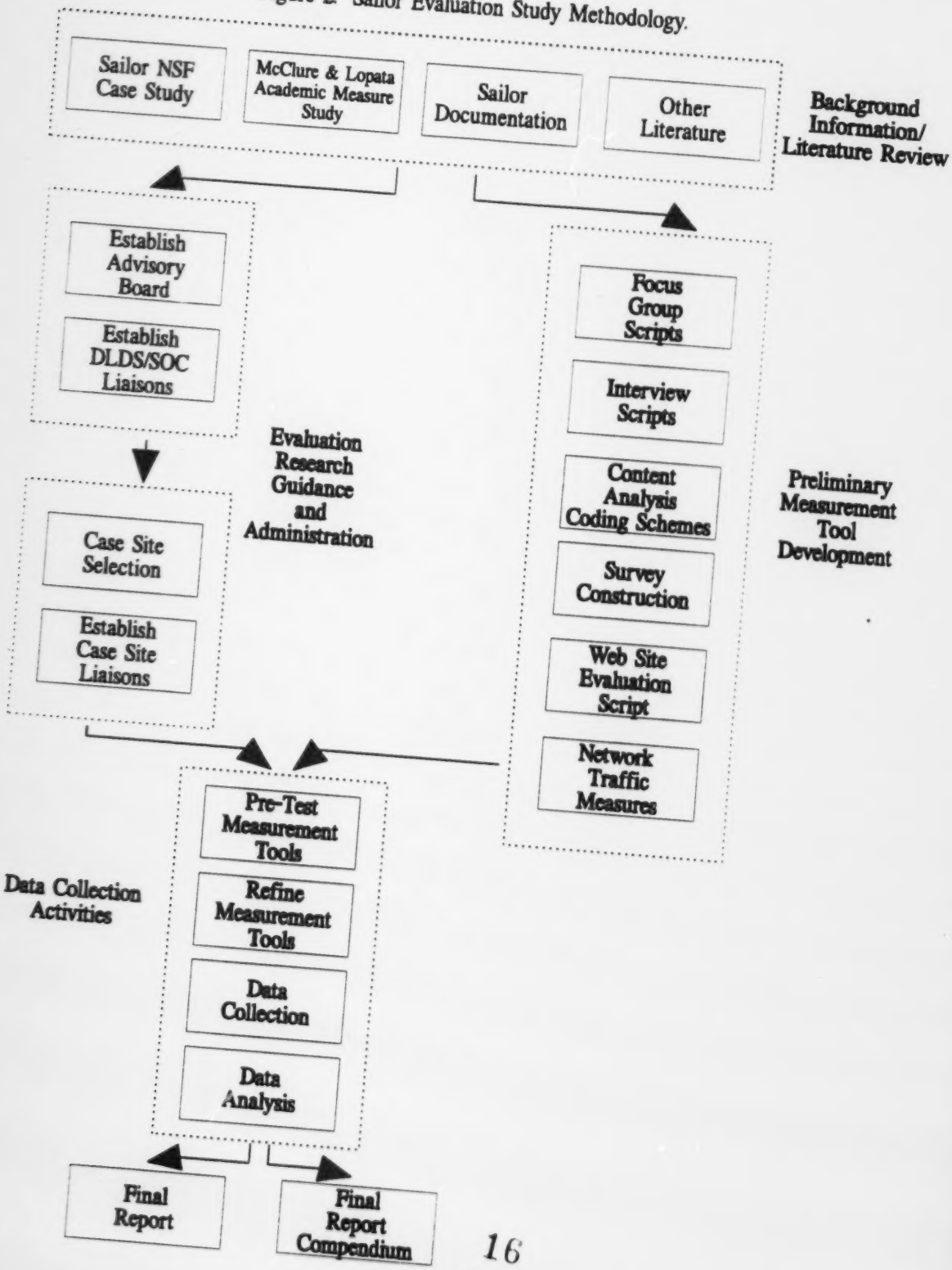
[2]Due to technical difficulties during March 1996, Ascend router data was collected between May 20, 1996 and July 25, 1996.

Figure 1. Methodologies for Developing Assessment Techniques.

Qualitative	Function/Purpose
Focus Groups	Explore identified key issue areas of network content, services, governance, and performance. Use findings to inform broader quantitative data collection activities such as mail and electronic surveys.
Small Group and Individual Interviews	In-depth exploration of network content, services, governance and performance with key state and local government policy makers. Assess the relationship between components of the network and future government use and development of networked resources. Use findings to inform broader quantitative data collection activities such as mail and electronic surveys.
Case Sites	In-depth exploration of selected state communities (i.e., counties) and target audiences within those communities (e.g, k-12, public libraries) use of and involvement with the statewide network. Use findings to inform broader quantitative data collection activities such as mail and electronic surveys.
Content Analysis	Gather various documentation and reports to review historical development and evolution of electronic network activities.
Quantitative	**Function/Purpose**
Mail/Electronic Surveys	Further explore identified key issue areas of network content, services, governance, and performance with broader state population. Test findings from qualitative data collection activities with broader state population.
Network Traffic Measures	Collect network traffic use statistics such as users, user access points, information and service content use, and network server and router load.

Figure 2. Sailor Evaluation Study Methodology.



Measurement Issues

Due to the complexity and multi-dimensionality of the electronic networked environment, evaluators face numerous methodological issues. For example, using the definition of a statewide network put forth later in this report, a researcher must decide which component of the network he/she is attempting to measure, what methods are appropriate for data collection activities within that network component, what variables are to measure, how best to define and measure those variables, and what data analysis tools are most appropriate to allow for meaningful interpretation of the collected data.

In addition to methodological issues, statewide network evaluation activities occur within a rapidly changing technological environment. While technological advances serve to enhance electronic network services, continual changes in technology force network evaluators to continually revise their network measures. In essence, this creates a situation in which evaluators are continually using modified and/or new measures, and are thus never really able to develop valid and reliable measurement tools through replication.

The methodological and technological aspects of electronic network evaluation create a challenging environment for network evaluators. Below are selected measurement issues that reside within this environment.

Distributed Network Environment

The degree to which a statewide network is distributed significantly affects the development of network performance measures. A distributed network environment, while fostering flexibility, presents the following challenges:

- Oftentimes there is no single person or unit that is "in charge" of networking development and services. As such, obtaining data about specific networking services or activities requires the evaluator to work with a number of individuals or units.

- Distributed systems, with different system administrators, and with varying levels of interest in evaluation, may have different types of data that measure very different aspects of the network.

- Evaluation techniques and measures that are needed and are appropriate for network-wide assessment may be different than those needed by individual network system components.

Thus, the distributed network environment may complicate the process for ongoing evaluation and performance assessment.

Management Information Systems (MIS)

An effective MIS provides decision makers with accurate and timely information that improves the information base from which decisions are made. Statewide

network decision makers may want to consider the creation of an MIS to capture, organize, analyze, compare, and report a range of data describing network activities and services. Unfortunately, many network evaluators have yet to formalize some type of MIS for their network and are thus unable to:

- Comprehensively capture, organize, analyze, and report information that describes network activities and services, network-related costs and expenditures, users of the network, and other institutional information related to the network. An MIS can

  - Identify and respond to network service strengths and weaknesses or the needs of network users,
  - Demonstrate the overall effectiveness and efficiency of the network, track various service or use trends, and report such information on a timely basis,
  - Simplify and standardize network data gathering and reporting procedures across the network, and
  - Monitor ongoing network activities and project network costs effectively.

Perhaps most importantly, statewide networks without some type of MIS are unable to determine which specific types of data are most important for collection and analysis. As such, data collection activities to monitor and assess the network are haphazard, uncoordinated, and likely to carry across the network depending on who collects the data.

Precision of Measurement

The rapidly changing electronic network technology, coupled with the multi-dimensional aspects of electronic networks, dramatically affects the ability of network evaluators to precisely measure various components of the network. Network performance measures are, therefore, perhaps best viewed as estimates of network performance, rather than precise performance measures. The accuracy of network measures are affected by such issues as the:

- Technological aspects of the statewide network. For example, depending how users of the network establish network connections, system administrators cannot track individual user movement throughout the network (an issue created by "guest" or "anonymous" logins).

- Ability of evaluators to identify, define, and measure network performance variables. Network evaluators report to multiple stakeholder groups, all of whom have different expectations of network services, view the purpose of network evaluation differently, and envision different outcomes from network evaluation activities. In such an environment, it is at best difficult to agree on variables to measure and ways in which to measure such variables.

- Difficulty in knowing what network evaluators are counting (Piper, 1996 - See Appendix D). There are multiple aspects of network traffic that can be counted in some fashion, for example, users, hits on a homepage, and

movement throughout a web site. One connection may not, however, equate to one user -- one connection in a library may be maintained during normal business hours, but several dozen users may use that connection.

- Use of standardized procedures to collect network performance data. The determination of overall network performance and impact in the statewide network environment relies on the use of common data collection elements and techniques throughout the network. This requires that all the distributed components of the network collect, or have the capability to collect, the same data in the same manner.

The electronic networked environment is, therefore, fluid and difficult to precisely measure. Evaluators can, however, determine variables to measure, ways in which to measure those variables, and use appropriate data collection techniques that allow for meaningful interpretation of such variables. These measures are, though, acceptable estimates of network performance rather than precise network measures.

Inventing New Methods and Instruments

To some extent, networked services and programs oftentimes require new methods for data collection and innovative techniques for designing data collection instruments. For example, a method was developed for this project to compare and assess a number of state library web sites. Criteria for assessing these sites had to be developed, and then they were measured through a "script" of procedures to insure reliable and valid data collection (see the final report *Compendium*). Thus, the idea of "assessing a web site" entailed a significant level of rethinking of method and instruments.

"Pop-up" questionnaires on web pages are another example of new methods and instruments which we are only beginning to test and understand as data collection instruments. The idea of having a short questionnaire "pop-up" on selected web pages and determining factors that contribute to or detract from their completion are not, as yet, well understood. And determining the degree to which respondents to the "pop-ups" are representative of all users of the webpage offers new challenges for assessing the generalizability of those responses.

When new methods and instruments are used, there is some responsibility on the part of the investigators to assess the appropriateness, usefulness, reliability, and validity of the techniques. When the researchers developed and used a web assessment script comparing Sailor to other state-based web sites, the script also collected data about the users' assessment of that survey as a data collection technique. Such an approach promotes the ongoing development and improvement of new data collection techniques.

Obtaining Webmeister Cooperation

Another key issue that must be addressed in completing network-based evaluations is obtaining cooperation from the network staff and webmeisters. These

staff, typically, are exceptionally knowledgeable about the configuration of the network, the points at which "sniffers" should or can be located, and how best to install and manage such devices. To a large degree, the amount of evaluation that researchers can successfully accomplish is dependent on the degree to which the network staff can, or will, work with the researchers.

Oftentimes, the cooperation needed also has to do with the costs for implementing assessment techniques. Sniffer software, programming expenses, other equipment, etc., can affect the degree to which the network staff are willing and able to assist in the assessment. For very large, statewide networks, implementing sniffers at all routers can be both expensive and can negatively affect network performance. Such issues affect the overall options available to complete the evaluation.

Defining the Sailor Network

A key challenge facing the study team was defining just what *exactly* the Sailor network is. Rather than being a single entity, the Sailor network is the sum total of many parts. For this study, however, we define the Sailor network to include the:

- Physical Infrastructure that consists of the network backbone, routers, servers -- in essence the hardware and software that are minimally required to provide electronic network services.

- Network Services that consist of information-based (e.g., on-line license applications, electronic tax filing) and database services (e.g., on-line encyclopedias, inter-library loan requests) provided via the network.

- Content Services that consist of unique information resources (e.g., historical state documents and images, state government legislation, local government information) available over the network.

- Governance Structures that develop and oversee the policies and procedures to direct the network's development over time and on a day-to-day basis. Further complicating the issue of governance is that governance structures can exist in the service and infrastructure components identified above.

The Sailor network is, therefore, a multi-dimensional and complex entity.

Contending with the Measurement Issues

The study team controlled for such measurement and definition challenges as best as possible by:

- Conducting pre-tests of all data collection activity instruments

- Seeking input from the Advisory Committee on data collection instruments and techniques

- Testing software and hardware to be used in data collection activities prior to use
- Eliciting the cooperation of data collection participants prior to commencing data collection activities
- Applying an evolutionary methodology that allowed previous data collection activities to inform future data collection activities
- Conducting post-data collection activity debriefings with data collection activity participants to identify issues/concerns about collected data.

These actions served to provide appropriate, valid, and reliable data for this study.

To form a baseline of fundamental Sailor network operations, in terms of backbone, content, and services development, the study team reviewed initial and on-going Sailor network planning documentation. The following section presents selected Sailor planning activities throughout the Sailor network's development.

THE BEGINNING OF THE SAILOR NETWORK

Sailor network planning[3] was initially begun at the request of the Maryland State Library Network Coordinating Council. The first broad overview of the project was prepared by the Seymour Working Group in December 1992. The Seymour Plan can be divided into five components:

- *Definition.* The original intent of Seymour was to provide an electronic infrastructure to connect Maryland libraries and residents. All Marylanders could conceivably access a statewide system of data and resources via the Maryland library system electronically.

  The electronic infrastructure of Seymour provided multiple levels of activity. These included:

  - Provision of a telecommunication backbone
  - Fax capabilities, electronic mail, and bulletin boards
  - Resource sharing to include full text data bases, bibliographic information, and other electronic resources
  - Freenets and community resource/information systems
  - Internet access.

- *Vision.* Seymour generated their vision statement in 1989 (DLDS, 1989). The mission statement reads:

[3]Although the name Sailor is used throughout this report, initial planning for Maryland's network occurred under the name of Seymour.

The Maryland State Library Network will provide the residents of Maryland with rapid, easy access to information, materials, and services from any available information source.

Subsequently, Seymour's vision statement called for easy access to information, materials, and services. This access would be available to all Maryland residents from home, office, school, or library (See Appendix A).

- *Overall Objectives.* In April 1992, the Seymour Working Group developed four objectives designed to make Seymour's vision statement a reality. They were:

  1. June 30, 1994 - Telecommunication backbone existent with 79% of Maryland users provided access to Seymour via a local telephone call.
  2. June 30, 1994 - Internet/NREN Doorway available.
  3. June 30, 1995 - Dial access capability for 96% of all Maryland libraries. The access services of **Find a Book**, **Find an Article**, **Find a Fact**, and **Find an Agency** available.
  4. June 30, 1998 Seymour services fully implemented, with **Find Government Information** available.

- *Implementation.* The Seymour Plan called for an incremental development and implementation approach, with telecommunications labeled as the first component. Implementation was planned to begin June 1, 1993, with full operation by July 1, 1994. The plan acknowledged the need for a development plan for maintenance and "help" services and stated, "The requirement for this service and potential supplier will be identified as the plan is developed (The Seymour Plan, 1993, p. 4).

The implementation component had essentially four telecommunications-related categories:

- Operations. The Seymour Plan called for reliance on all appropriate national standards, such as Z39.50 (computer interfacing), Z39.58 (common command language), US MARC, and ISO 1016000/10161 (interlibrary loan). Also noted was a "spoke and hub" arrangement, with the hubs denoted as UMCP, Pratt, UM Eastern Shore, and UMAB. These hubs are connected by the University of Maryland Network or an Internet connection. Telecommunications implementation was to begin with the existing nodes at Prate and UMCP. It was suggested that telecommunications may be best handled by UMCP with a possible role for the State Library Resource Center (Pratt)

  Mention was also made of the need for "user support specialists" and listed the Regional Library Resource Centers (Hagerstown, Charlotte Hall, and Salisbury) and Pratt as the primary providers. The plan stated that these centers were "...well positioned to be the primary providers of user support and backup services (p. 11).

- Backbone. The backbone was designed to link major libraries in Maryland via the TCP/IP protocol. The plan projected local phone access to the 72% of residents living in 19 of Maryland's 24 local jurisdictions (counties + Baltimore City). The initial implementation for this backbone was to begin in late FY 1993, with a projected completion date of June 30, 1994.

- Library Infrastructure. Five remaining counties were found to lack the appropriate equipment for the initial Seymour backbone connection. Integration of these counties into the backbone was addressed under Project LINKUP (The Seymour Plan, 1993). The intent was to place switching and terminal server equipment and modems strategically around the state. For example, the rural counties of Caroline and Dorchester were targeted with projected resident access of 100% and 89%, respectively. In addition, LINKUP proposed extended coverage to three of the initial backbone jurisdictions (Garrett, Montgomery, and St. Mary's). Project LINKUP was to begin in FY 1994, and the completion date was slated for June 30, 1995 (see Figures 3 and 4).

- Education. Throughout the Seymour Plan emphasis was placed on the educational component of the system. However, education as it related to vendors and providers was absent, as DLDS operated under the assumption that the vendors and providers possessed adequate technical expertise to assist DLDS develop the Sailor backbone. This assumption proved erroneous, and a co-educational effort between DLDS, Sailor Operations, and Bell Atlantic ensued throughout the development of Sailor.

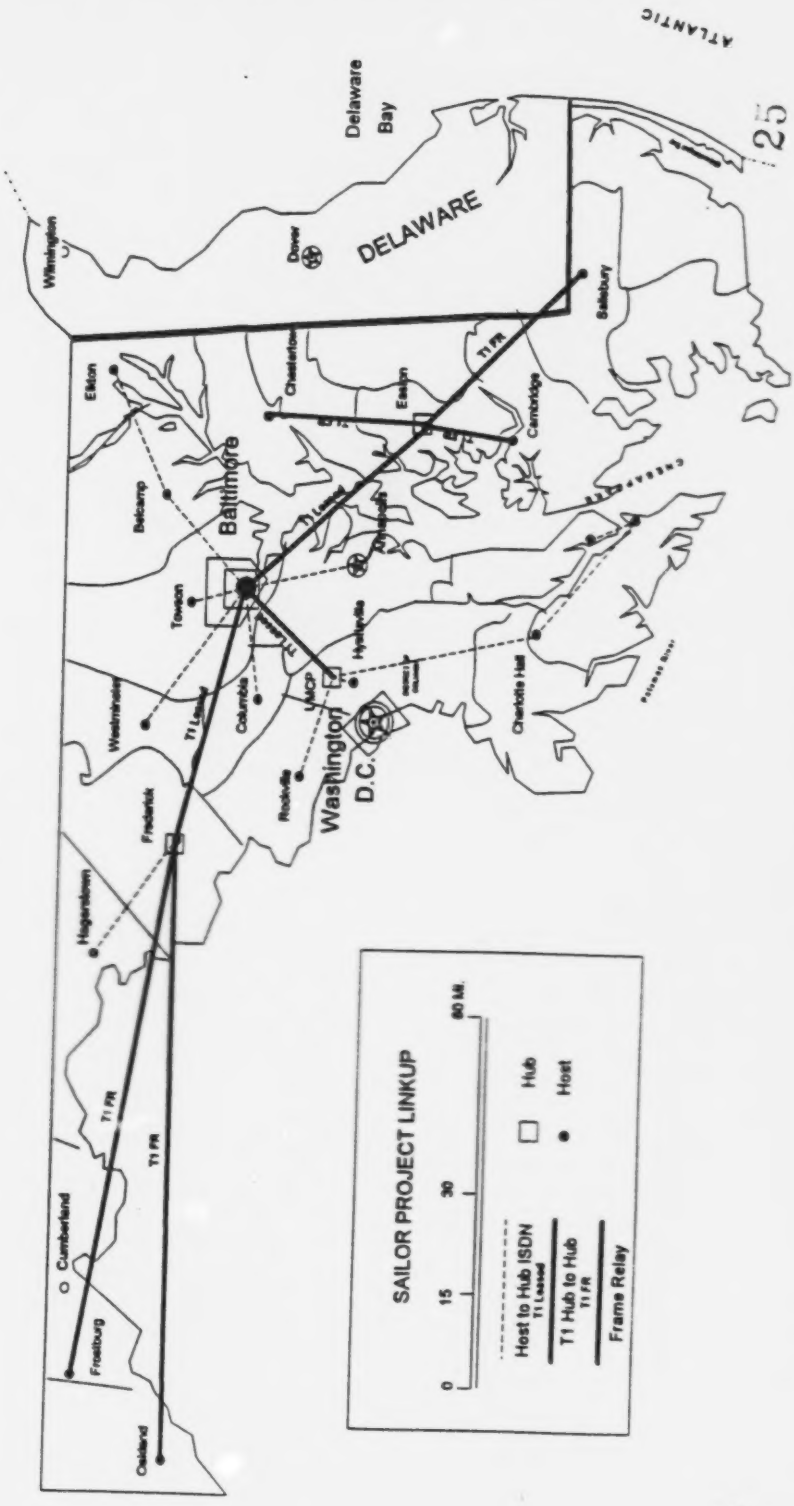
- *Resource/Information Services.* These services were designed to build upon existing Maryland bases of automation and access. Two facets of resource/information development and planning were identified:

  - Migration. The Seymour Plan identified "clusters" of libraries that used automated systems. For example, the CARL system served the University of Maryland (13 sites) and 1 public library, and the CLSI system served 11 public library systems. In addition, these clusters were viewed as evolving due to new system development and installation. Most clusters had the potential to provide a single type of interface between Seymour and local automated systems. For sites without a single type of interface (eg. CLSI), a Z39.50 interface that standardizes communications could be installed. Through dial access or a Z39.50 interface, it was stated that all Maryland libraries have the potential to connect with Seymour.

  - Retrieval Services. Retrieval services included a number of information content- and service-related projects. Such projects included:

    - **Project Interlibrary Loan**. Solicitation to vendors via a request for information (RFI) for resource sharing software to meet the needs of the system. Planned RFI distribution - January, 1993, and recommendations to be made by September 1993.

Figure 3. Sailor Network Project Linkup.



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Phase 1 Libraries ISDN Topology
FSU
MCFL
CeCL
BCPL
HaCL
FCPL
UMAB
CaCL
MCPL
HoCL
EPFL
UMCP
AACL
PGCL
TCPL
SMRLA
SSU
WICO
AACL = Anne Arundel County Library (CLSI)
BCPL = Baltimore County Public Library (CARL)
CaCL = Carroll County Library (Dynix)
CeCL = Cecil County Library (CLSI)
EPFL = Enoch Pratt Free Library (CLSI & SURANet access point)
FCPL = Frederick County Public Library (VTLS)
FSU = Frostburg State University (UBIS network routing site)
HaCL = Harford County Library (DRA)
HoCL = Howard County Library (Dynix)
MCPL = Montgomery County Public Library (CARL)
PGCL = Prince George's County Library (CLSI)
SMRLA = Southern Maryland Regional Library Association (CLSI)
SSU = Salisbury State University (UBIS network routing site)
TCPL = Talbot County Public Library (Dynix)
UMAB = University of Maryland at Baltimore (UBIS network routing site)
UMCP = University of Maryland at College Park (CARL & UBIS network routing site)
WCFL = Washington County Free Library (CLSI)
WICO = Wicomico County Free Library (CLSI)
= ISDN Primary Rate Interfaces
= ISDN Central Office Interconnectivity
= ISDN Central Office
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Figure 4. Sailor Network ISDN Topology.

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- **Project Seymour Database Management System**. A plan for maintaining Seymour locally for libraries that lack automated system platforms.

- **Project USING INTERNET VIA SEYMOUR**. This project envisioned the development and promotion of Internet access to Maryland libraries. Provision of information packets to Directors were to be delivered by April 30, 1993 and training packets by late spring 1993. Training was to continue through the next fiscal year.

- **Project FIND A BOOK**. Provision of electronic access to Maryland bibliographic records and ILL requests. Initial implementation was slated for FY 1994, with increasing responsibilities and management of ILL from FY 1995 through FY 1997.

- **Project FIND A FACT**. A two-stage plan designed to answer specific questions or retrieve information on a particular topic. Stage 1 - ability to search through encyclopedias, almanacs, etc. to begin FY 1994. Stage 2 - enable a **FETCH!** command for data from all databases. Development of **FETCH!** FY 1995-98.

- *Funding and Governance.* The issues related to governance are unclear in the Seymour Plan (see Figures 5 through 9). Nevertheless, it was determined that governance would be addressed by The Network Coordinating Council. Governance issues included:

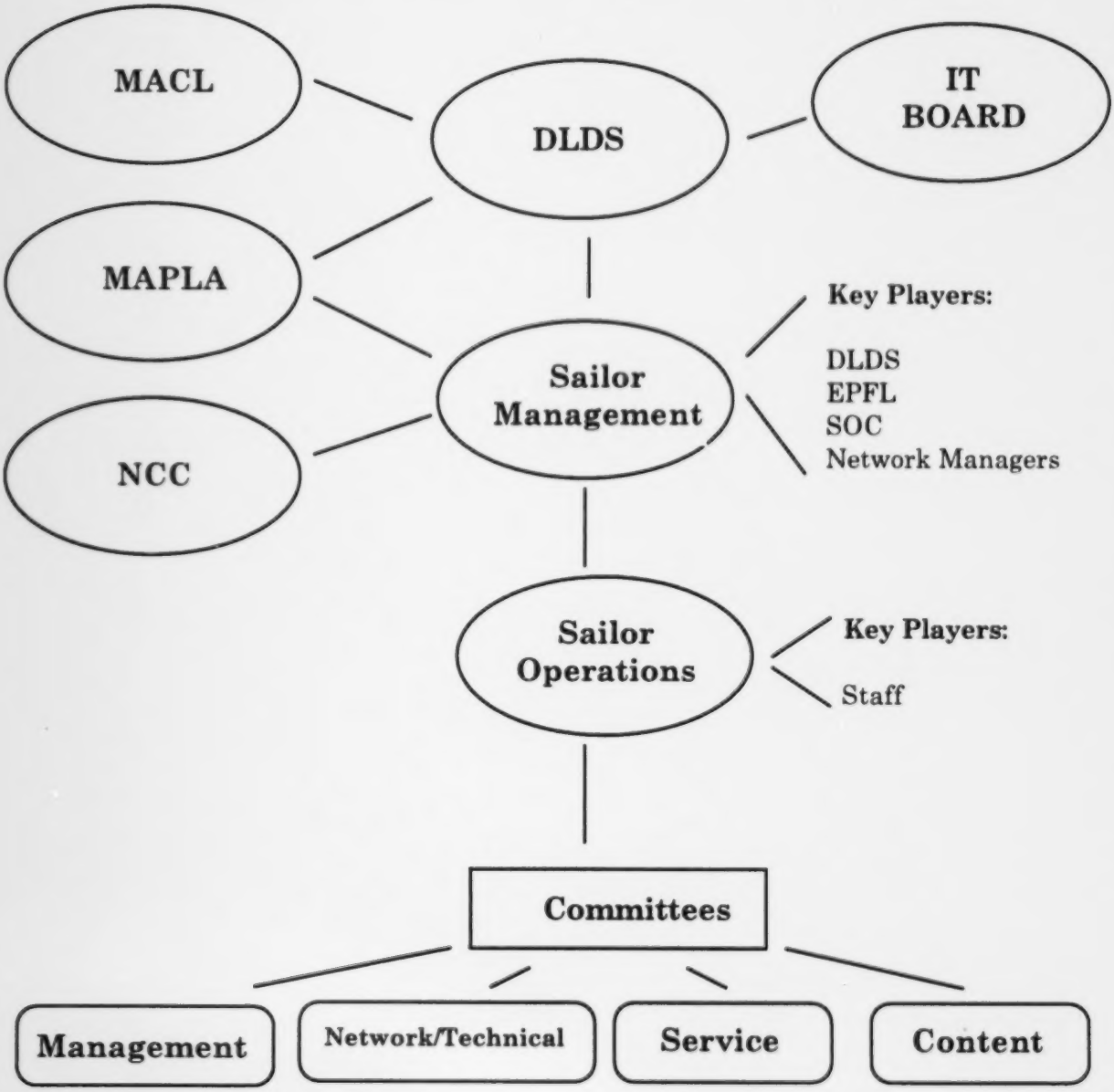
  - Network policies and procedures
  - Development issues
  - Future possibilities, decision-making
  - Definition & oversight of access to government databases

  The rapidly changing Internet technology arena, combined with an overall lack of a clear formal Sailor management structure, set into motion a flexible, and sometimes confusing and competing, Sailor network management framework (as Figures 5-9 demonstrate).

  Funding for initial Sailor network planning, development, and implementation came primarily from federal Library Services and Construction Act (LSCA) monies (see Appendix B). The individual library systems also contributed a significant amount of in-kind funding for the Sailor network (e.g., personnel time), but such contributions were difficult to assess. From federal 1993-1995 Fiscal Years, a total of $2,062,773 was diverted from Maryland public libraries to operate Sailor. Beginning with this year, state FY1996, Maryland appropriated $250,000 to EPFL for maintaining the Sailor network backbone.

The above discussion of Sailor planning activities serves as a basis for measuring the attainment of Sailor network objectives, interpreting the findings from the data collection activities, and recommending future directions for Sailor network

Figure 5. Sailor Network Organizational Hierarchy.



MACL - Maryland Advisory Committee on Libraries
MAPLA - Maryland Association of Public Library Administrators
NCC - Network Coordinating Council
DLDS - Division of Library Development and Services, Maryland State Department of Education

Figure 6. Sailor Network Management Entities.

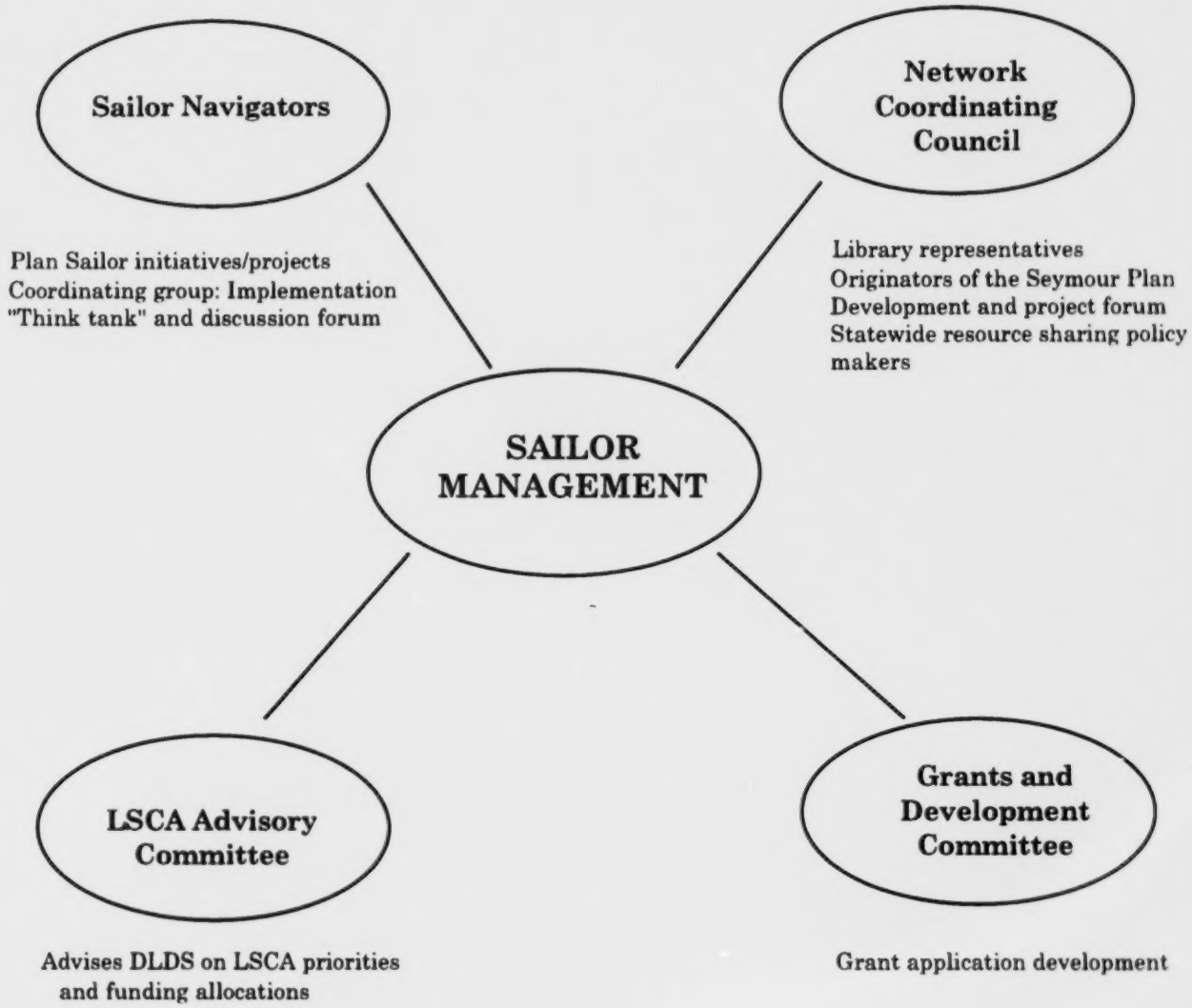
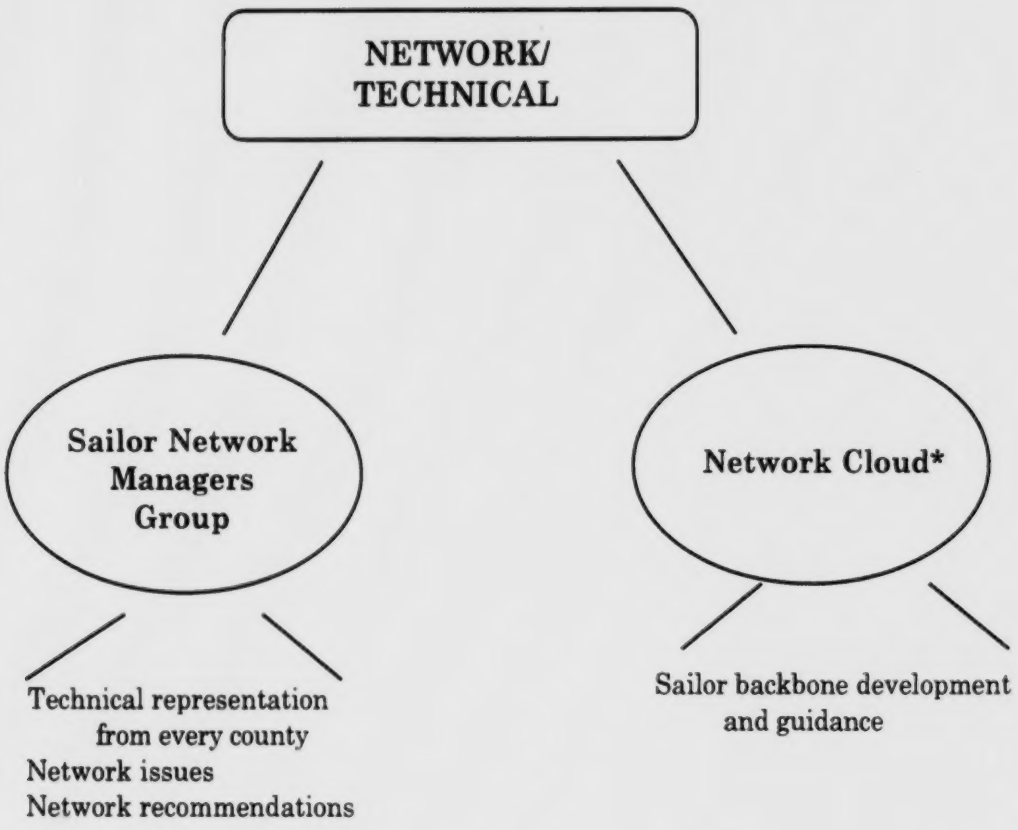


Figure 7. Sailor Network/Technical Management Structure.



*Network Cloud is both a committee and project name that is responsible for the development of and future direction setting for the Sailor network backbone.

Figure 8. Sailor Network Service Entities.

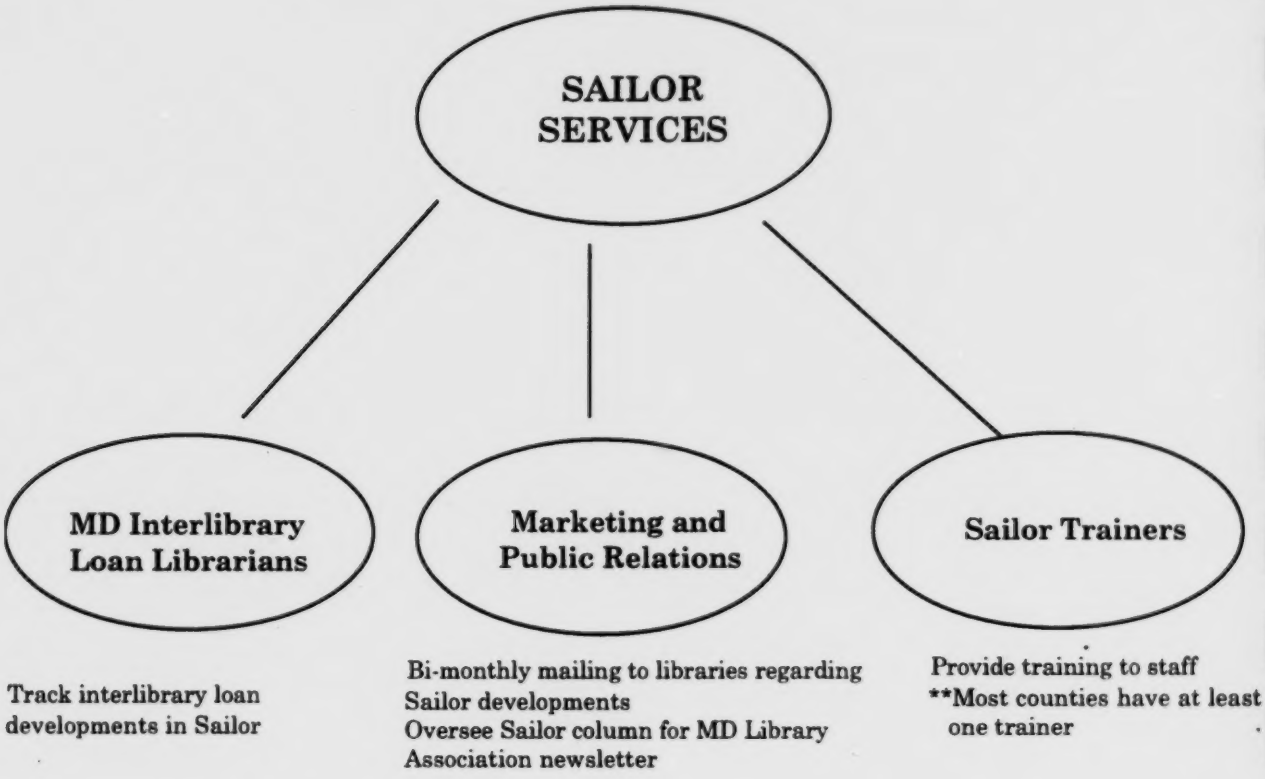

SAILOR SERVICES
MD Interlibrary Loan Librarians
Marketing and Public Relations
Sailor Trainers
Track interlibrary loan developments in Sailor
Bi-monthly mailing to libraries regarding Sailor developments
Oversee Sailor column for MD Library Association newsletter
Provide training to staff
**Most counties have at least one trainer

Figure 9. Sailor Network Content Development Entities.

SAILOR CONTENT
Sailor Editorial Board
Appoint the Tropical Area Reviewers
Development of Sailor Web site development policies
Topical Area Reviewers
Appointed volunteers
Identify and evaluate appropriate Web sites

development. The next section presents Sailor network usage statistics gathered during the evaluation project.

SAILOR NETWORK USAGE STATISTICS

As part of this study, the researchers, with assistance from the Sailor Operations Center staff, collected both Sailor network server usage statistics and case site Ascend router usage statistics.[4] The initial methodology intended to simultaneously collect case site and server statistics throughout March 1996. As this was the first attempt at Ascend router usage collection, however, technical difficulties prevented the collection of Ascend router statistics during March 1996. This section, therefore, presents Ascend router and Sailor network server statistics from two differing time periods -- March 1996 for the Sailor network and May 20, 1996 through July 25, 1996 for case site Ascend routers.

The types of statistics gathered during this study include the following:

- Sailor network server sessions initiated by IP (Internet Protocol) address to determine from where server traffic is initiated (see Figure 10);
- Sailor network server sessions by day of week (see Figure 11);
- Sailor network server sessions by hour of the day (see Figure 12);
- Sailor network server most frequent file requests (see Figure 13);
- Sailor network server requests to Maryland state agency Web sites (see Figure 13);
- Sailor network Help Desk usage statistics for March 1996 (see Figures 14 and 15);
- Case site Ascend router usage by hour (see Figures 16-19);
- Case site Ascend router traffic by day (see Figure 20); and,
- Case site Ascend router traffic call duration (see Figure 20).

The researchers note in the *Compendium* that other usage statistics can and should be collected by Sailor network-connected entities.

During this study, no Maryland library that connected to the Sailor network through a DLDS-supported connection did so through a log-on procedure. As such, users of Sailor connected to the sever as "guest" (as indicated in Figure 10 through

[4]During this study, the Sailor network operators were in the process of terminating the Sailor gopher server, and did so on June 30, 1996. The declining gopher statistics, therefore, reflect the impending gopher server shutdown.

the "guest" designation). Furthermore, a majority of Maryland libraries did not have a Point-to-Point (PPP) type of connection to the Sailor network. The basic Sailor network connection, therefore, consisted of a non-graphical "Lynx" or gopher connection to the Sailor home page or gopher server (again included in the "guest" category in Figure 11). Some Maryland library systems, however, established separate PPP connections. These are reflected in the "Web" category in Figure 10.

For March 1996, the Sailor Web server received a total of 592,979 hits and the Sailor Gopher server received a total of 285,622 hits (see Figure 10). Of those 592,979 Web hits, 396,497 were "guest" logins. Of the 285,622 Gopher hits, 243,790 were "guest" logins. As Figure 10 demonstrates, a majority of the Sailor network "guest" logins originate from Maryland public libraries, with 95.0% of all "guest" logins. The top five public library system users of the Sailor servers within the Maryland public library community for March 1996 were Montgomery County (16.96%), followed by Enoch Pratt Free Library (13.10%), Harford County (8.24%), Anne Arundel County (8.19%), and Prince George's County (7.23%). The top three non-"guest" login users of the Sailor Web server are .com (commercial) users (9.30%), followed by .net (network provider-most likely users that purchase Internet accounts through Internet service providers) users (4.60%), and .edu (academic institution) users (3.62%).

In general, Sailor server traffic is steady throughout the week (see Figure 11). The slowest Sailor network use day in March was Sunday, with 105,376 total Gopher and Web hits, while the most heavy network traffic day in March was Friday, with 144,223 total Gopher and Web hits. The Sailor Gopher and Web server use peaked between the hours of 2:00PM and 4:00PM, with 128,109 hits (see Figure 12). It is interesting to note that Sailor server traffic was steady (range of hits from 65,923 to 128,108) between 8:00AM and midnight each day, while the least amount of server traffic was generated between midnight and 8:00AM each day (range of hits from 10,688 to 30,987).

Not surprisingly, the most heavily accessed file on the Web server during March 1996 was the Sailor home page with 169,831 hits (28.66%), as each Web session generally begins at the home page (see Figure 13). In terms of content-oriented Sailor files, the top five most accessed files were the Topics (e.g., Arts & Humanities, Business & Consumer) pages with 103,053 (17.38%) hits, followed by the Forms (e.g., Lycos and Webcrawler) searches pages with 70,881 (11.95%) hits, the Picture file (e.g., .gif images) pages with 42,165 (7.11%) hits, the About Sailor (e.g., Sailor project information) pages with 29,194 (4.92%) hits, and the Documents (e.g., miscellaneous documents, e-mail gateway) pages with 28,471 (4.80%) hits. Figure 13 demonstrates that the Maryland state agency pages were not heavily used during March 1996, comprising only 13.10% of the Sailor Web server traffic. As Figure also 14 indicates, the Sailor Gopher was predominantly used for external Internet connections, with 64,316 (22.52%) hits.

During March 1996, the Sailor Operations Center (SOC) Help Desk responded to 2,298 help requests (see Figure 14). Of those requests, 562 (see Figure 14, Staff 5 and Staff 6) -- 18.7% -- were received via e-mail. In addition, 365 Help Desk requests -- 12.2% -- were from Metnet (Maryland's educational K-12 network) users. The SOC

Figure 10. Sailor Server Traffic for the Month of March 1996 by IP Address.

		Guest[1]	%	Gopher[2]	%	Web[3]	%
Sailor				**243,790**	**85.35%**	**396,497**	**66.87%**
IP Address							
.lib.md.us							
	Allegany (234)	1,072	0.64%	0	0.00%	0	0.00%
	Anne Arundel (192)	13,760	8.19%	147	0.05%	9,109	1.54%
	Baltimore County (200)	9,494	5.65%	859	0.30%	6,431	1.08%
	Calvert (226)	1,138	0.68%	0	0.00%	0	0.00%
	Carroll (196)	7,179	4.28%	305	0.11%	2,001	0.34%
	Cecil (206)	7,525	4.48%	0	0.00%	1	0.00%
	Dorechester (250)	1,031	0.61%	0	0.00%	0	0.00%
	EPFL (192)	21,990	13.10%	0	0.00%	3,705	0.62%
	Frederick (232)	9,242	5.50%	0	0.00%	0	0.00%
	Garrett (236)	831	0.49%	0	0.00%	0	0.00%
	Harford (204)	13,838	8.24%	0	0.00%	0	0.00%
	Howard (212)	9,361	5.57%	124	0.04%	0	0.00%
	Kent (252)	1,885	1.12%	0	0.00%	0	0.00%
	Montgomery (220)	28,477	16.96%	0	0.00%	0	0.00%
	Prince George's (216)	12,141	7.23%	0	0.00%	0	0.00%
	Queen Anne (254)*	3	0.00%	0	0.00%	0	0.00%
	Southern Md (224)	2,048	1.22%	94	0.03%	0	0.00%
	St. Mary's (228)	2,021	1.20%	0	0.00%	0	0.00%
	Talbot (246)	3,049	1.82%	0	0.00%	0	0.00%
	Washington (236)	8,932	5.32%	0	0.00%	0	0.00%
	Wicomico (244)	4,143	2.47%	15	0.01%	0	0.00%
	Md Elec. Capital (193)	0	0.00%	8	0.00%	2,060	0.35%
	SUBTOTAL	**159,163**	**95.00%**	**1,552**	**0.54%**	**23,307**	**3.93%**

Figure 10. Sailor Server Traffic for the Month of March 1996 by IP Address.

		Guest[1]	%	Gopher[2]	%	Web[3]	%
IP Address							
.md.us		709	0.42%	461	0.16%	2,900	0.49%
.com		1,082	0.64%	7,362	2.58%	55,119	9.30%
.edu		1,428	0.85%	11,825	4.14%	21,463	3.62%
.gov		607	0.36%	2,764	0.97%	8,035	1.36%
.us		109	0.06%	1,444	0.51%	833	0.14%
.mil		357	0.21%	789	0.28%	2,200	0.37%
.net		377	0.22%	3,616	1.27%	27,298	4.60%
.org		136	0.08%	764	0.27%	3,260	0.55%
	SUBTOTAL	**4,805**	**1.49%**	**29,025**	**10.16%**	**121,108**	**20.42%**
.ar		28	0.02%	4	0.00%	0	0.00%
.au		55	0.03%	66	0.02%	176	0.03%
.ca		292	0.17%	454	0.16%	444	0.07%
.cz		33	0.02%	24	0.01%	121	0.02%
.uk		22	0.01%	73	0.03%	277	0.05%
other non-us		30	0.02%	464	0.16%	1,831	0.31%
	SUBTOTAL	**460**	**0.27%**	**1,085**	**0.38%**	**2,849**	**0.48%**
unresolved IPs and failed requests		2,321	1.38%	10,170	3.56%	45,431	7.66%
TOTALS**		**167,913**	**100.00%**	**285,622**	**100.00%**	**592,979**	**100.00%**

[1]The "guest" logins equate to the number of users that accessed the Sailor network servers as guests. In this figure, 167,913 guest logins generated 243,790 gopher and 396,497 Web network server hits, respectively (see the "Sailor" row in the figure). The IP addresses in the "guest" column indicate the addresses that generated the guest login -- e.g., the Baltimore County library system users generated 9,494 guest logins to the Sailor network servers.

[2]The "Gopher" column is the number of gopher server hits generated by users of the Sailor network. Of the 285,622 total hits, 243,790 were generated by "guest" logins. The remaining hits were generated by library system local area networks or OPACS that could directly access the Sailor gopher and other non-Ascend router dial-up users.

[3]The "Web" column is the number of Web server hits generated by users of the Sailor network. Of the 592,979 total hits, 396,497 were generated by "guest" logins. The remaining hits were generated by library system local area networks or OPACS that could directly access the Sailor Web page and other non-Ascend router dial-up users.

*Site not open to public during March 1996.
**Totals do not sum to 100.00% in all cases due to rounding errors as well as missing data points.

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Figure 11. Sailor Network Server Use by Day of Week for March 1996.

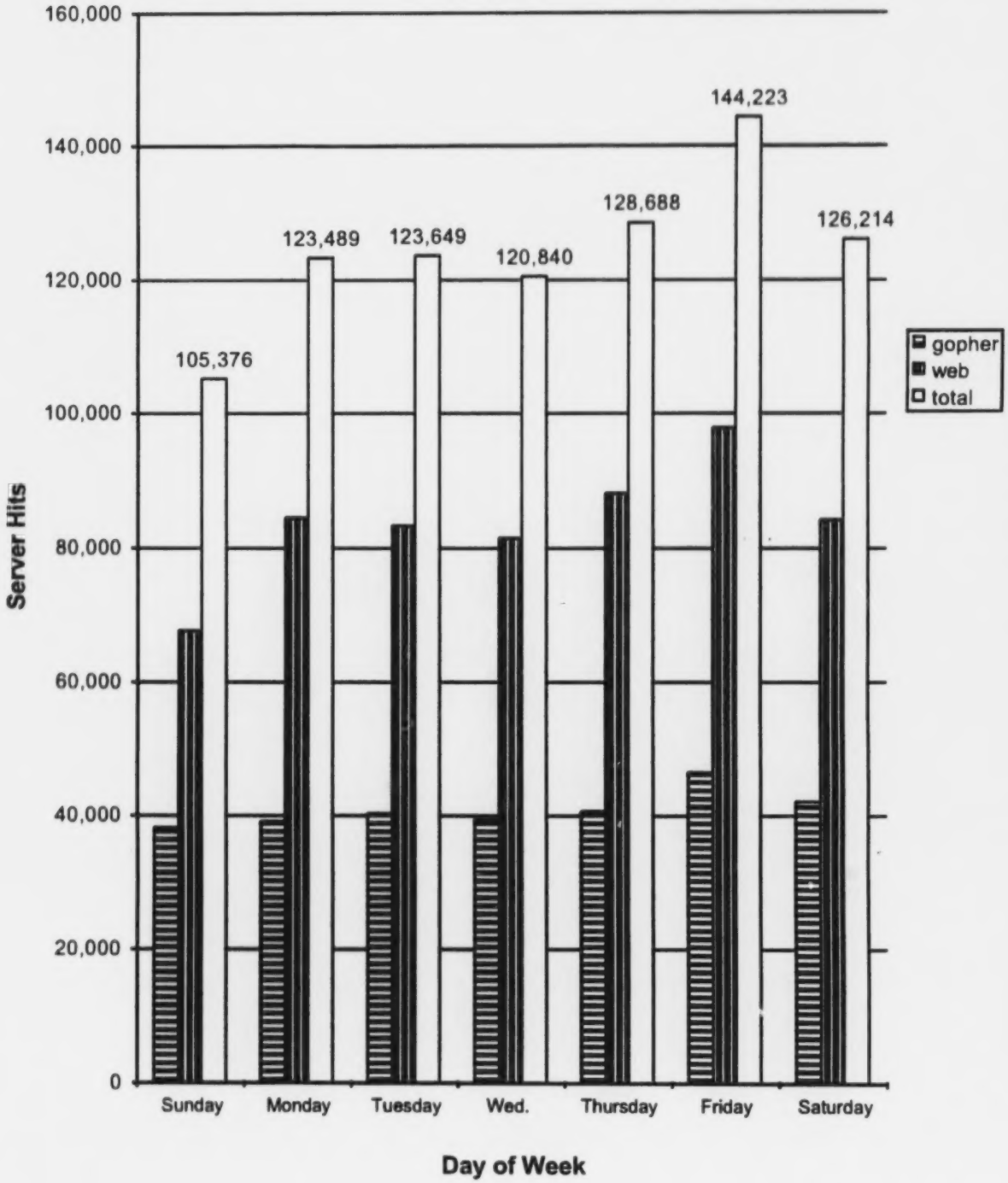

Figure 12. Sailor Network Server Use by Hour for March 1996.

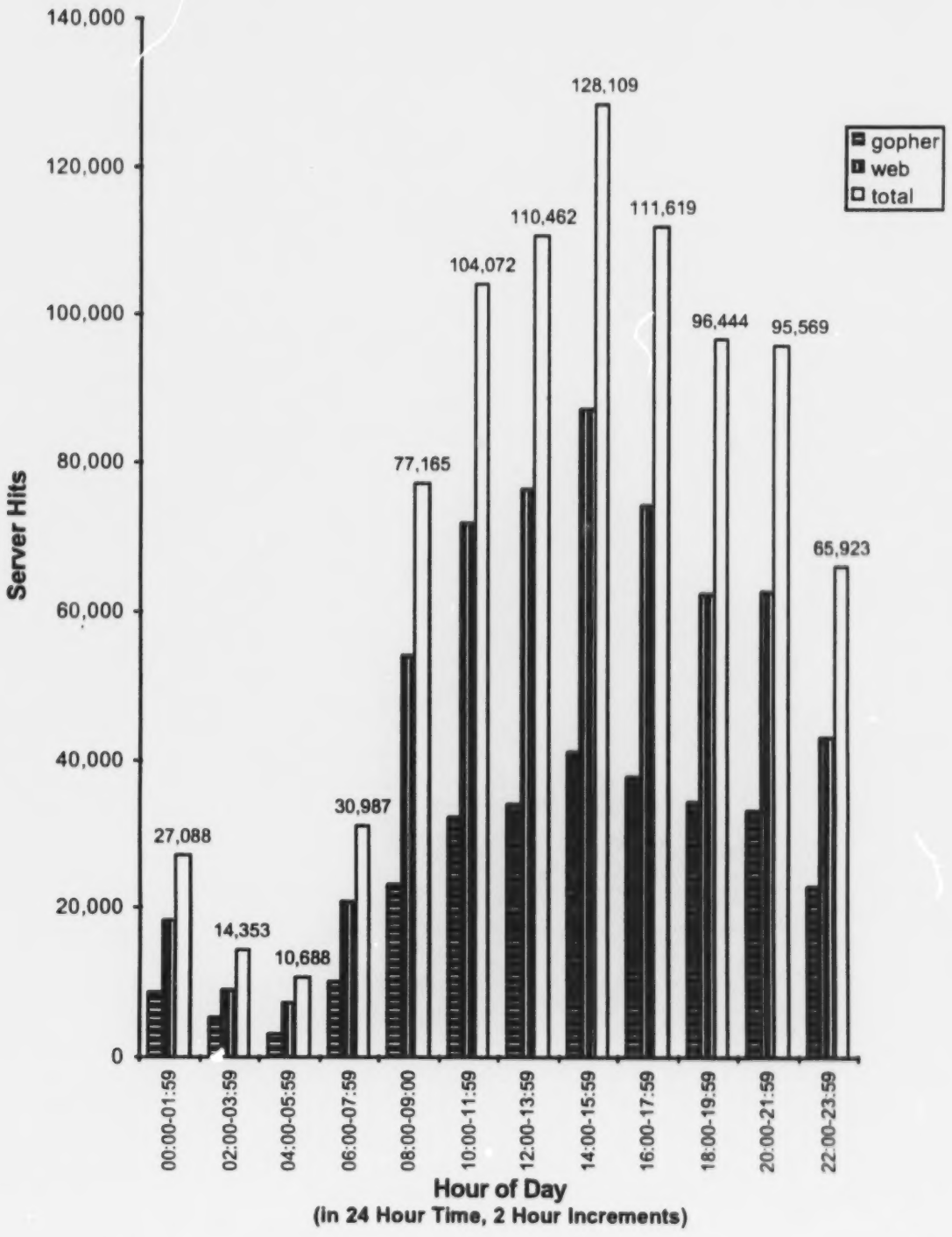

Figure 13. Sailor Server File Usage for March 1996.

Directory	Hits	%	Comments
WEB			
root	169,831	28.64%	Home page
sailor	29,194	4.92%	About sailor project
md	7,583	1.28%	Maryland government page
mdcounty	9,310	1.57%	Maryland county pages
mdlibs	7,738	1.30%	Maryland libraries
mdedu	3,149	0.53%	Maryland education
mgiug	2,884	0.49%	State government Internet Users Group
topics	103,053	17.38%	Topic homepages
forms	70,881	11.95%	Search forms
gifs	42,165	7.11%	Picture files
docs	28,471	4.80%	Misc. documents, includes e-mail gateway page
cgi	22,813	3.85%	Scripts and searches
			GPO: 1785
			MEC imagmap: 6623
			MEC searches: 1448
			Full-text Sailor: 1343
			URL Sailor: 8615
			State phone dir: 824
			Minority biz dir: 528
			Maryland state docs bib: 457
lynx	12,524	2.11%	
stats	2,069	0.35%	
archives	1,132	0.19%	Old "What's New, Hon"
gpo	429	0.07%	Government Printing Office help file
SUBTOTAL	**515,367**	**86.9%**	
MD AGENCIES			
mec	65,717		Maryland Electronic Capital
dllr	5,536		Dept of Labor, Licensing, and Regulation
msla	2,364		Lottery
dmil	1,133		Military
mda	968		Agriculture
msde	930		Education
sra	341		Retirement
mgcos	187		Governor's Commission on Service
msbca	101		Board of Contract Appeals

Figure 13. Sailor Server File Usage for March 1996.

Directory	Hits	%	Comments
bpw	100		Pubic Works
oah	89		Administrative Hearings
mema	51		Emergency Management
pscp	48		School Construction
osp	20		State Prosecutor
wab	17		Wine Advisory Board (ag)
SUBTOTAL	**77,602**	**13.1%**	
TOTAL	**592,969**	**100.0%**	
GOPHER			
root	70,819	24.79%	Homepage
internet	64,316	22.52%	External connections
findInfo	33,369	11.68%	By topic
govinfo	12,917	4.52%	Government information
looklibs	12,463	4.36%	Libraries
aboutsailor	6,946	2.43%	Information file on Sailor
comminfo	2,661	0.93%	Community information
whats	1,037	0.36%	Whats new
TOTAL	**285,622**	**71.61%***	

*Totals do not sum to 100.00% to rounding errors as well as missing data points.

Figure 14. SOC Sailor Help Desk Log for March 1996.

	Sailor	Pratt	Metnet	Other	Total
Staff 1	178	84	60	401	723
Staff 2	241	88	246	122	697
Staff 3	186	148	28	12	374
Staff 4	226	76	14	10	326
Staff 5	0	81	0	0	81
Staff 6	481	0	0	0	481
Staff 7	98	52	10	31	191
Staff 8	74	34	7	10	125
Total	1484	563	365	586	2998

Notes on the above data:

The number of calls in the category Other for **staff 1** is large because that person was responsible for retrieving voice-mail and distributing messages to other staff (especially voice-mail that accumulated overnight).

Staff 5 corresponds to the flow of e-mail to a Pratt Accounts Administration e-mail address.

Staff 6 corresponds to the flow of e-mail to sailor@mail.pratt.lib.md.us (sailor@epfl2). There are two sources of mail flow sailor@mail.pratt: Feedback, Please (on sailor.lib.md.us) and mail posted directed to that address from the senders e-mail account.

Figure 15. Help Desk Calls by County for March 1996.*

County	Logged Calls	Percentage of Total Calls
Anne Arundal	39	7.3%
Baltimore City	29	5.4%
Baltimore County	84	15.7%
Calvert County	4	0.7%
Carroll County	15	2.8%
Cecil County	8	1.5%
Charles County	1	0.2%
Dorchester County	6	1.1%
Frederick County	12	2.2%
Garrett County	7	1.3%
Harford County	31	5.8%
Howard County	40	7.5%
Kent County	18	3.4%
Montgomery County	35	6.5%
Enoch Pratt	82	15.3%
Prince George's County	37	6.9%
Queen Anne's County	2	0.4%
Somerset County	1	0.2%
Talbot County	14	2.6%
Washington County	12	2.2%
Wicomico County	7	1.3%
Worcester County	1	0.2%
Other	49	9.2%
Total	535	100.0%

*This figure is best viewed as a rough estimate of Help Desk use by County. Not all incoming calls to the SOC Help Desk are tracked by location.

Help Desk receives calls from nearly all Maryland library systems, as well as from other sources (see Figure 15). Baltimore County and Enoch Pratt Free Library users, by far, generated the most Help Desk calls, with 15.7% and 15.3%, respectively.[5]

Appendix E contains the most current SOC annual report (FY1996). This report contains updated Sailor network and Help Desk use statistics. In addition, this report provides useful Sailor network development information.

Figures 16 through 19 show the Ascend router traffic for the four case sites of Enoch Pratt Free Library, Harford County, Montgomery County, and Wicomico County.[6] The data corroborates that of the Sailor server traffic data presented in Figure 13, indicating that the case site Ascend routers received the most number of calls between the hours of 8:00AM and midnight. Figure 16 also shows that the Enoch Pratt Free Library Ascend router averaged the highest number of calls per hour between May 20, 1996 and July 25, 1996, with 20.2 calls per hour, followed by Montgomery County with 15.9 calls per hour, Harford County with 9.1 calls per hour, and Wicomico County with 3.2 calls per hour. The Enoch Pratt Free Library Ascend router averages 420.3 calls per day, followed by the Montgomery County router with 263.7 calls per day, the Harford County Ascend router with 121.2 calls per day, and the Wicomico County router with 23.6 calls per day (see Figure 20). On average, calls to the Enoch Pratt Free Library Ascend router last 63.1 minutes, calls to thee Harford County Ascend router last 229.9 minutes, calls to the Montgomery County router last 63.75 minutes, and calls to the Wicomico County router last 168.7 minutes (see Figure 20).[7]

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[5]The SOC Help Desk did not routinely track all incoming calls by originating location during this data collection activity. In addition, although the Help Desk attempted to gather originating call Zip Code information, not all caller Zip Code information was collected. The final report *Compendium* contains a listing of the originating call Zip Code information captured during March 1996. As such, caller county and Zip Code data presented in this report are best considered as rough estimates of the SOC Help Desk usage by location.

[6]As indicated on the figures, these data were collected between May 20, 1996 and July 25, 1996, due to technical difficulties in collecting Ascend router data during March 1996.

[7]During the data collection activity, the case site routers did not have any time-out features that would log off idle connections. Furthermore, Ascend router technical difficulties during data collection activities influenced the ability to capture accurate logon time data. As such, these statistics are best viewed as estimates of call duration.

Figure 16. Total EPFL Ascend Router Calls by Hour (May 20, 1996-July 25, 1996)

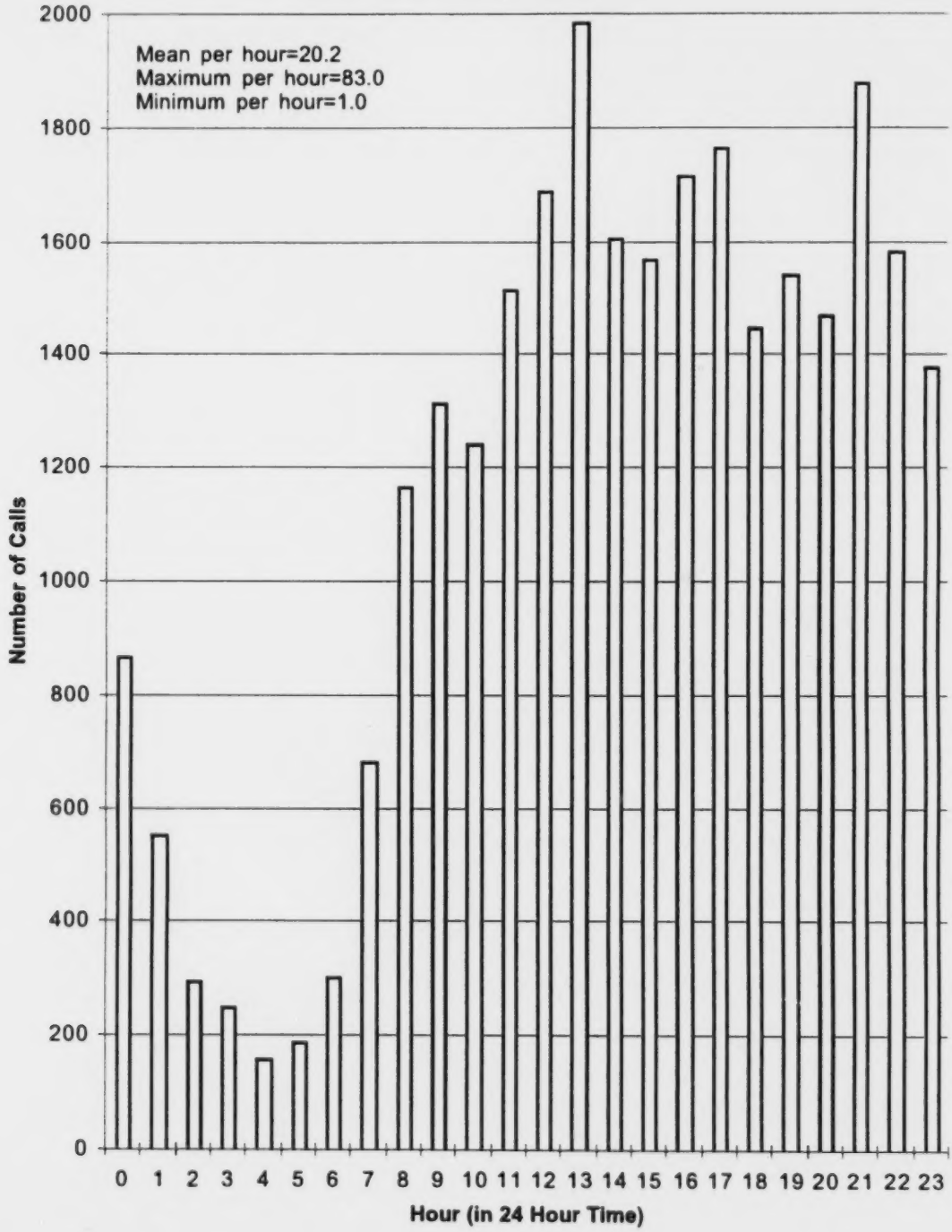

Figure 17. Total Harford County Ascend Router Calls Per Hour (May 20, 1996-July 25, 1996)

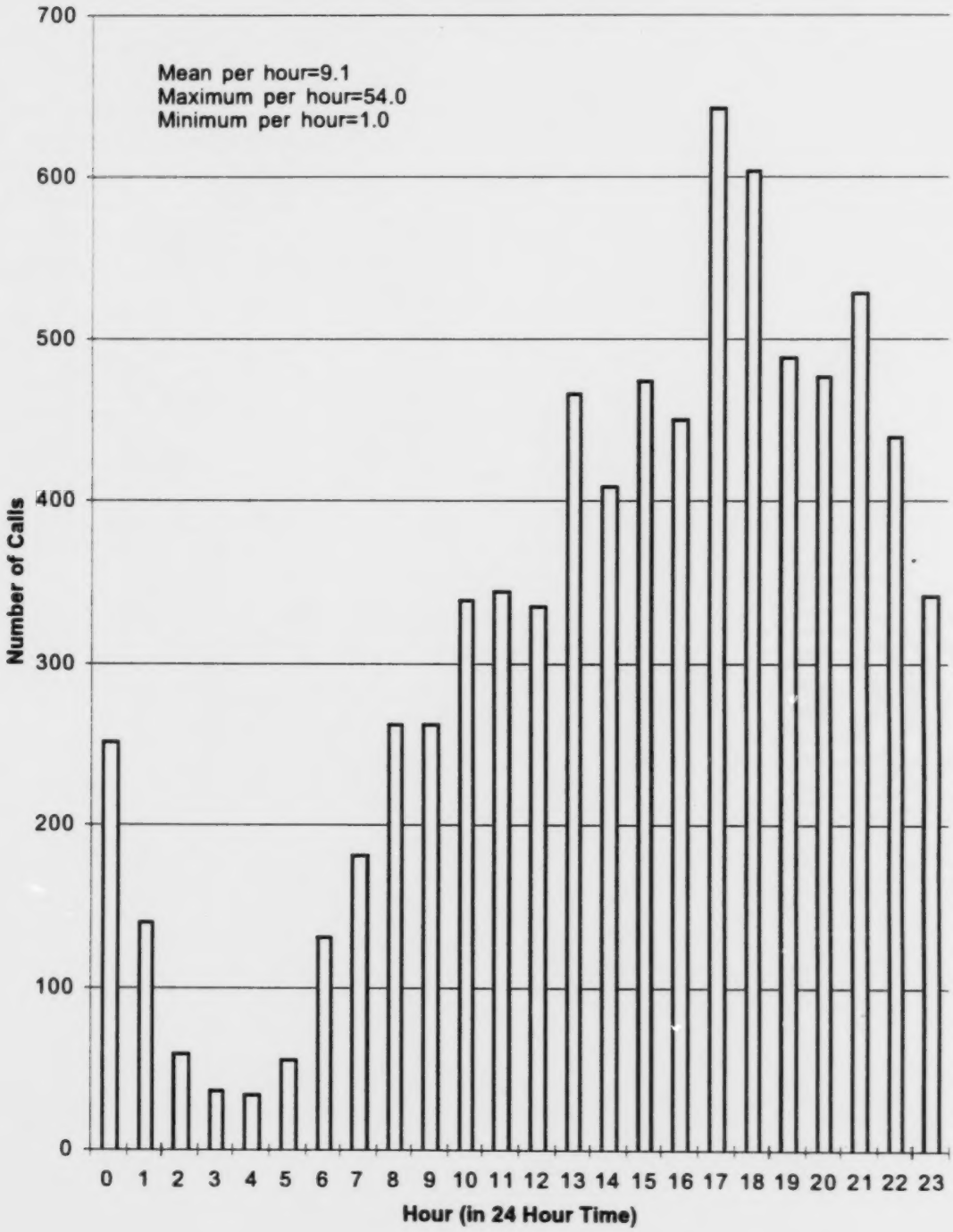

Figure 18. Total Montgomery County Ascend Router Calls by Hour (May 20, 1996-July 25, 1996)

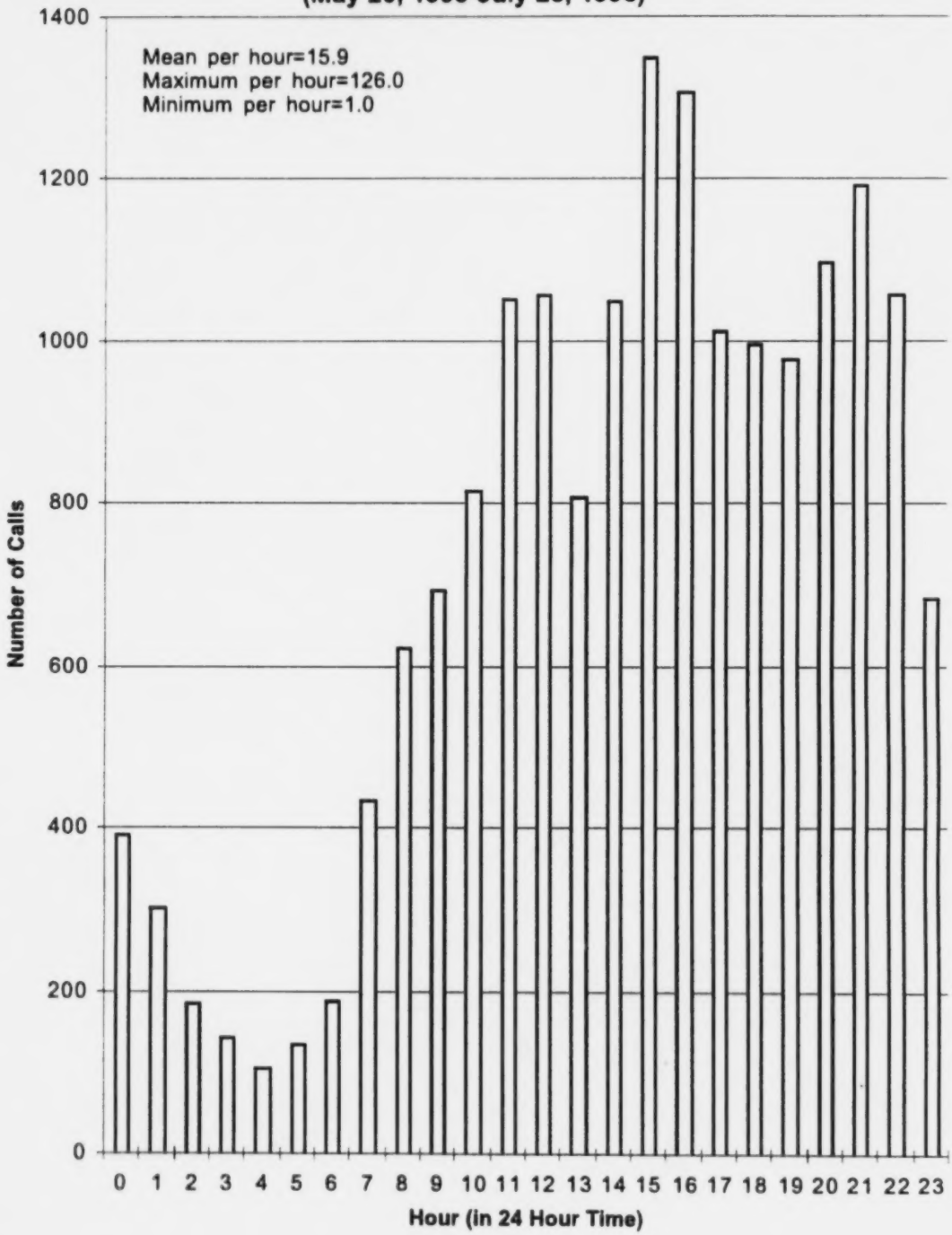

Figure 19. Total Wicomico County Ascend Router Calls by Hour (May 20, 1996-July 25, 1996)

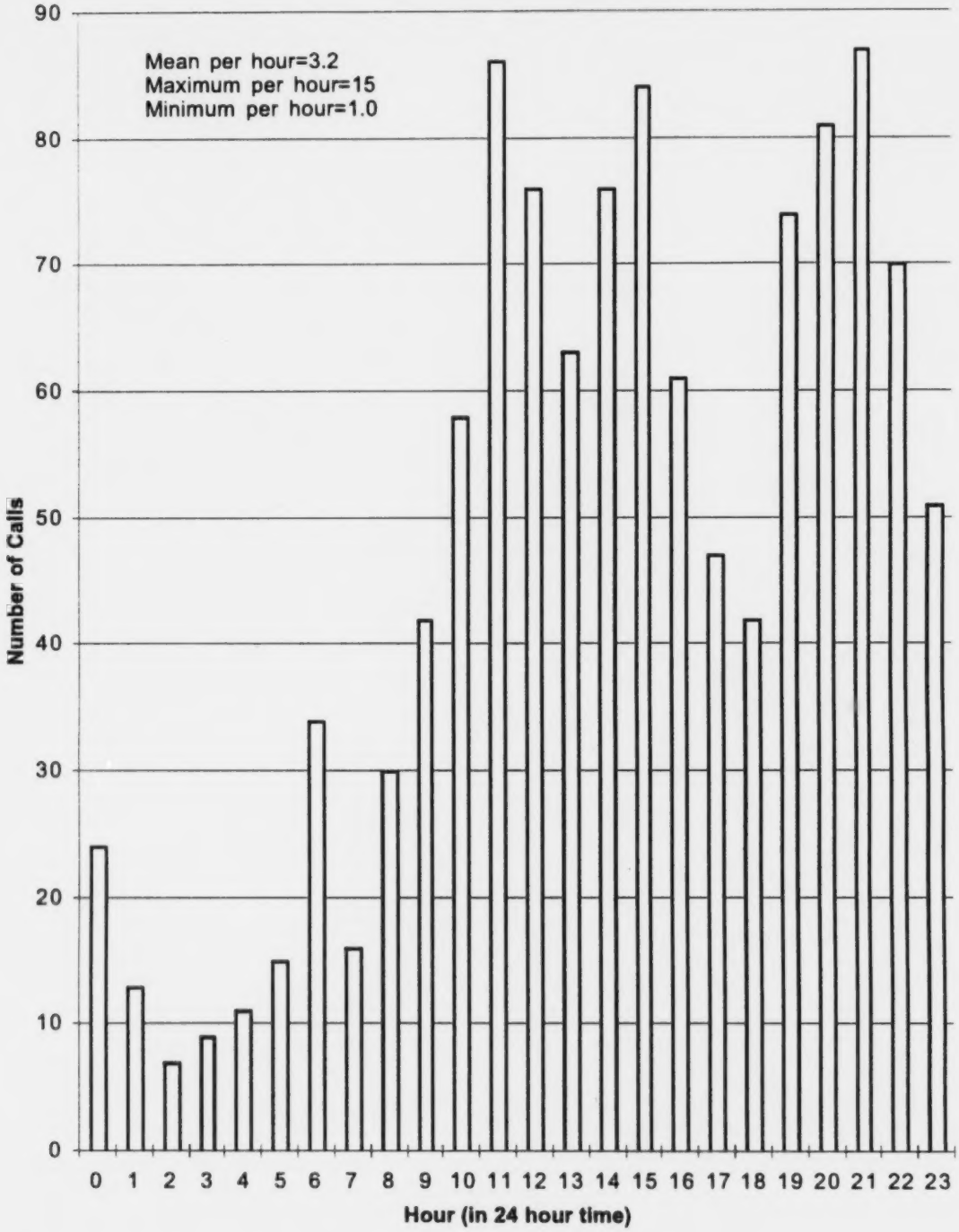

Figure 20. Ascend Router Calls Per Day and Call Duration (May 20, 1996-July 25, 1996).*

	Ave. Calls Per Day	Max. Calls Per Day	Min. Calls Per Day	Ave. Duration of Calls (in Minutes)	Max. Duration of Calls (in Minutes)	Min. Duration of Calls (in Minutes)
Enoch Pratt (n=28,157)	420.3	791.0	275.0	63.1	46,047	<1
Harford County (n=7,759)	121.2	259.0	44.0	229.9	46,029	<1
Montgomery County (n=17,666)	263.7	853.0	63.0	63.75	46,061	<1
Wicomico County (n=1,157)	23.6	50.0	1.0	168.7	36,110	<1

*These statistics are best seen as estimates. The numbers provided are influenced substantially by such factors as router up time, router modem card operation, and router statistical gathering software on the Sailor host machine. Also, during this data collection period, no time-out feature on idle router connections were in place, as the average and maximum duration of calls indicate.

The statistics indicate that the Sailor Gopher and Web servers are used primarily by Maryland citizens dialing in through a county library system. The data also indicate that use of Sailor varies greatly between Maryland county library systems -- a reflection of which county systems have had Sailor network connections for a greater amount of time as well as local technology initiatives, county demographics in terms of education, in-home technology, and access to technology through K-12 and academic institutions. Finally, the data indicate that the Gopher server is primarily an Internet gateway, used to connect its users to other Internet-based services, whereas the Web server is primarily a means through which users access topical, state and local government/community information, and perform Internet resource searches.

The above section presented Sailor network, Sailor Help Desk, and case site Ascend router usage statistics. These statistics are key extensiveness indicators, as discussed in the report's *Introduction*, that provide the Sailor network user, administrator, and policy maker communities with data to assess the overall use of the Sailor network.

These network use and extensiveness measures, however, require regular collection at the local and state levels. To do so will require the standardization of data elements, definitions, and data collection techniques at the library system, Sailor connected entity, and state library levels. This report offers an initial set of network usage and service measure statistics, and recommends additional statistical data collection activities in the final report *Compendium*, as indicators of the Sailor network performance. These usage and service measure statistics, however, will require refinement and, ultimately, the development of new statistics, as the Sailor network evolves over time.

Additionally, continued and new network usage and service measure statistics will require the resolution of a range of issues as identified in this report. These issues include, but are not limited to, the agreement of Sailor network connected entities to collect statistics in a uniform manner, the ability of DLDS and SOC to collect and report statewide usage statistics, the determination of, on a statewide basis, what data to collect, and an understanding by data collection activity participants of exactly what data is being collected and how to interpret such data. The Piper (1996) paper, title, in Appendix D presents an excellent beginning discussion of these issues.

The above statistics provide baseline data that provide a context for the study's findings in terms of Sailor network management, direction setting, and content development issues. This is the context in which the next section presents the study's key findings.

KEY FINDINGS

This section presents the most salient study findings that pertain to each of the Sailor network dimensions identified in the Study Methodology section. The final report *Compendium* contains more detailed study findings in the case study write-ups as well as other data collection activity components.

Governance Issues

A recurring issue throughout the data collection activities was that of Sailor governance. As discussed in the introduction and methodology sections, governance is the multi-dimensional governing mechanism for Sailor network operations, content development, technical support, and funding. With such a complex entity as a statewide electronic network, it is oftentimes difficult to create a single governing entity that is responsible for all network components. The Sailor network was no different, employing a sometimes nested, often difficult to follow, governance structure. Thus, study participants felt a genuine lack of network management control. Some commented that the lack of a formal governing body for the Sailor network resulted in no policy-making board. Figures 5-9 serve to emphasize the difficulties study participants had in identifying specific Sailor network entities that governed Sailor long-term, mid-range, and day-to-day operations and planning.

In the previously discussed *Seymour Plan*, overall Sailor network governance was to fall under the purview of the Network Coordinating Council (NCC). Indeed, interviews with NCC members indicated this to be the case. In reality, however, there were several Sailor network governance entities with multiple, sometimes overlapping, responsibilities. As such, the study team found it necessary to identify and classify the Sailor network governing entities. For example, the:

- DLDS, with its control over the disbursement, with public library director agreement, of federal Library Services and Construction Act (LSCA) monies that are the primary funding source of Sailor.
- NCC, with its broad statewide representation outside the public library community, was the defacto long-term Sailor network planning committee.
- Maryland Association of Public Library Administrators (MAPLA), primarily comprised of public library system directors, bridged the long-term Sailor network planning activities of the NCC and those of each individual library system.
- Network Navigators handled the mid-range Sailor network planning activities, with a particular emphasis on technological applications and implementation schedules.
- Network Administrators maintained each nodes equipment and connection.

- Sailor Operations Center (SOC) maintained the Sailor network backbone, servers, and help desk function -- essentially the day-to-day managers of Sailor.

- Topical Area Reviewers (TARs) identified, organized, and loaded Sailor server content.

Such a wide array of Sailor network governing bodies often left participants wondering who, exactly, was in charge of Sailor. This was particularly the case in terms of strategic planning activities, as it was unclear where one group's responsibilities ended and another group's began for the NCC, MAPLA, and Network Navigators.

The lack of a clear governance structure left library systems unsure as to the appropriate fora for such key networked environment issues and concerns as censorship and intellectual property. Participants believed that there was no clear means through which to establish Sailor-wide policies regarding such issues. As such, each library systems was developing its own policies independently of Sailor and the other library systems.

New Governing Board

Due to the lack of a clear governing body for the Sailor network, there was a sense among library directors and other library governing body members, that there was no appreciable control over the development of the Sailor network. That is, the network evolves and "things happen" without their knowledge or understanding. Factors contributing to this sentiment included:

- A perceived communication gap between Sailor developers (e.g., SOC) and external entities. At issue is the lack of a single reporting mechanism, as well as an appropriate determination of what information needs to go to what group, for Sailor network-related occurrences. DLDS, SOC, MAPLA, NCC, etc., all have separate reporting structures, types of publications, and means of distribution. It was unclear to study participants as to how decisions were made to distribute what material to what groups for what reason.

- The constantly evolving information technology and telecommunications components of the Sailor network. The Sailor network backbone was, by design, developed in an evolutionary manor. In doing so, the backbone developers and planners could take advantage of evolving technologies that better satisfied the needs of network's technical requirements. The evolutionary approach, however, required that SOC and DLDS make quick and time-dependent decisions. By definition, such decisions do not allow for lengthy discussion or lengthy committee approval processes. As such, participants often felt removed from the technical specifications of the Sailor network.

- No single accountable Sailor network governing body. Participants suggested the need for establishing a formal governing board. Such a board would have

> representatives from various stakeholder groups and perhaps recognize some geographic representation as well. It is important to clarify the governance, improve communication, and clarify the means by which Sailor development and decisions can be affected.

Based on the above, study participants from all aspects of the Sailor network called for the establishment of a new, central, and coordinated, Sailor network governing body. This body was to take charge, at a high level, of Sailor network future overall directions, develop governing policies, and seek out continued funding for Sailor.[8]

Purpose of the Sailor Network

In order to govern the Sailor network, participants expressed the need for Sailor to have a clear statement of purpose. Throughout the data collection activities, it was not always clear what, exactly, the purpose of the Sailor network was, or who, exactly, should be selected to govern Sailor. The lack of a Sailor network mission had an impact on individual library system. As one library director stated, "we cannot plan at a local library level for Sailor development when we don't know Sailor's purpose."

The lack of understanding, or clarity, of the Sailor network's intent is largely due to two factors:

(1) The varied interpretations and implementation of the *Seymour Plan*. As discussed in the *Beginning of Sailor* section, the *Plan* set forth the key goals and objectives of the Sailor network. The *Plan* offers a vision of what a Maryland statewide electronic network would do for the citizens of Maryland. In addition, the *Plan* offers specific applications for the network.

(2) The communication issue raised above. Study participants essentially felt "out of the loop" in terms of what the Sailor network was or, more accurately, had evolved to. Due to technological changes, difficulties encountered during implementation, and a fluid development environment, changes in Sailor network development were made as necessary. Without adequate communication channels, these changes were interpreted by study participants as deviating from the original intent of Sailor. This is particularly

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[8]After data collection activities ended, the Network Coordinating Council (NCC) adopted the following resolution to begin the process of formalizing a Sailor network governing body:

> That the NCC as currently constituted be empowered to serve as the governing board, through an executive committee, for Sailor network operations, content development, technical support, and funding, including grants management.

Since the adoption of the resolution, a formal governing board was established (see Appendix C for a copy of the board membership).

the case for individual applications (e.g., Inter-Library Loan) that were promised but not delivered in a timely fashion.

Study participants called for a new look at the Sailor network -- what it was, is, and should be in the future.

Cost Effectiveness of Sailor

Determining the actual cost of operating, maintaining, and developing the Sailor network is not an easy task due to the:

- Lack of precise financial data for much of the Sailor network. Financial data is available for federal Library Services and Construction Act (LSCA) monies disbursed for Sailor network expenses due to reporting requirements imposed by the federal government. Also, SOC publishes cost data on an annual basis. Such data, however, represents essentially hardware/software, telecommunications, and personnel costs -- items that are easily tracked.

- In-kind contributions by participating Sailor network entities. No study participant (library system administrator, DLDS staff person, SOC staff person, etc.) could provide an estimate of what each entity contributes in terms of such items staff time, training, and travel to the Sailor network. Such items are not part of normal budgeting and accounting procedures, leaving a potentially large portion of Sailor network operations costs unaccounted for.

The Sailor network costs worksheet presented in Appendix B, therefore, is only a rough estimate of actual Sailor network costs.

To get a better sense of Sailor network costs, the study team asked how much would it cost for a provider to operate and maintain the Sailor network infrastructure rather than DLDS through EPFL. The answer was problematic, but the sense was that the annual expenses would be much greater than the $800,000 being spent during the current fiscal year. When pressed, some estimated $1.3 to $2 million perhaps.

A key issue raised during this evaluation project was the degree to which Sailor is cost effective compared to other providers operating the network. To make such a determination, however, would require the development and standardization of cost accounting methods for Sailor network-connected entities.

Funding Sailor

Initial funding, and a vast majority of continued funding, for the Sailor network came from federal LSCA money. Traditionally, the federal government distributes LSCA monies to each state library agency which subsequently distributes portions of the funds to public libraries for a variety of projects -- e.g., building and technology upgrades, special collection development, etc. To initiate the Sailor network project, the 24 Maryland public library systems agreed to forgo, for a period of two years

(based on the LSCA disbursement mechanisms), their LSCA money. Such funds were to be used by DLDS to, as one library director stated, "Get Sailor up and running."

The two year LSCA cycle ended during this evaluation project, and library system participants raised concerns about continuing to bear the brunt of Sailor network funding. This was particularly the case since state funding for the Sailor network was not forthcoming in amounts to cover the overall costs of the network.[9] Essentially, participants contended that it was the 24 systems that paid for Sailor by foregoing their LSCA for two years. Yet, that LSCA money had benefitted K-12, local governments, etc. -- essentially the entire state. In return, however, libraries received little specific benefit from Sailor while simultaneously bearing all the costs of creating Sailor through LSCA money.

Participants also raised the issue of continued and future funding for Sailor. Some saw the specter of possible library system-Sailor network conflict given the current management structure of the Sailor network, as discussed above. Library administrators began to express serious concern in continuing to fund Sailor "with our money" while not having any real -- or very little-- control over the management, content, and services components of the Sailor network. Questions broadly on the topic of "where will we get the resources for future Sailor network development AND support for local library operations related to Sailor?" were recurring.

The creation of a new governing board, as discussed above, serves to heighten the Sailor network funding issue. Follow-up interviews with study participants concerning the development of the new Sailor board (see Appendix C) suggests that paying for the Sailor network is a more critical issue than ever. Now, with such broad representation throughout the state on the board, the key question is: "Who pays for Sailor?" The creation of the board formally signals the transition of the Sailor network from a public library project to that of a statewide resource with multiple stakeholder groups now involved in Sailor network development and guidance. Critical to the success of this transition will be the development of multiple funding streams for the Sailor network -- not just LSCA money.

Role of Enoch Pratt Free Library (EPFL)

A related issue to the funding and cost-effectiveness of the Sailor network is the role of EPFL in Sailor network operations. Participants did not find the demarcation between EPFL and SOC to be clear, and often wondered if there was a blurring of Sailor operations and EPFL management.

The crux of the issue centered on the accurate and regular reporting of expenditures. A number of people commented on the ambiguity of who -- EPFL, DLDS, SOC -- is actually paying for what. For some, there was the perception that

[9] The state only began contributing funding to the Sailor network last fiscal year in the amount of $250,000 -- enough to cover the operation of the Sailor backbone. DLDS received the same amount of funding from the state for the current fiscal year.

Pratt is getting "a good deal;" for others, there was the belief that not all the money that goes to Pratt actually supports the network; still others contended that EPFL contributes a range of support and resources to the Sailor network. The lack of consistent and standard cost accounting methods prevent the resolution of this issue.

Physical Infrastructure Issues

During the time of this study, there were three flavors of the Sailor network, two of which were text-based (gopher and WWW via Lynx), and one that was graphical through the WWW. The Sailor backbone consists of 27 nodes (see Figure 21). Five main issues arose concerning technical aspects of Sailor:

- *Consistency*. Due to the differences in Sailor servers (gopher v. WWW; text v. graphical), different resources, capabilities, and information were sometimes available to users.

- *Reliability*. Participants expressed concern over the network's reliability in terms of (1) Overall Sailor network performance; (2) Modem port availability; and, (3) Content.

- *Ease of use*. Participants were on the whole concerned with Sailor's user friendliness.

- *Technical support*. Many users, particularly those responsible for maintaining community-based Sailor connections and training both organization staff and the public, lamented the "inadequate technical support" provided by SOC.

Changes that the Sailor network and SOC underwent in March/April 1996 address some of the above issues. These changes included:

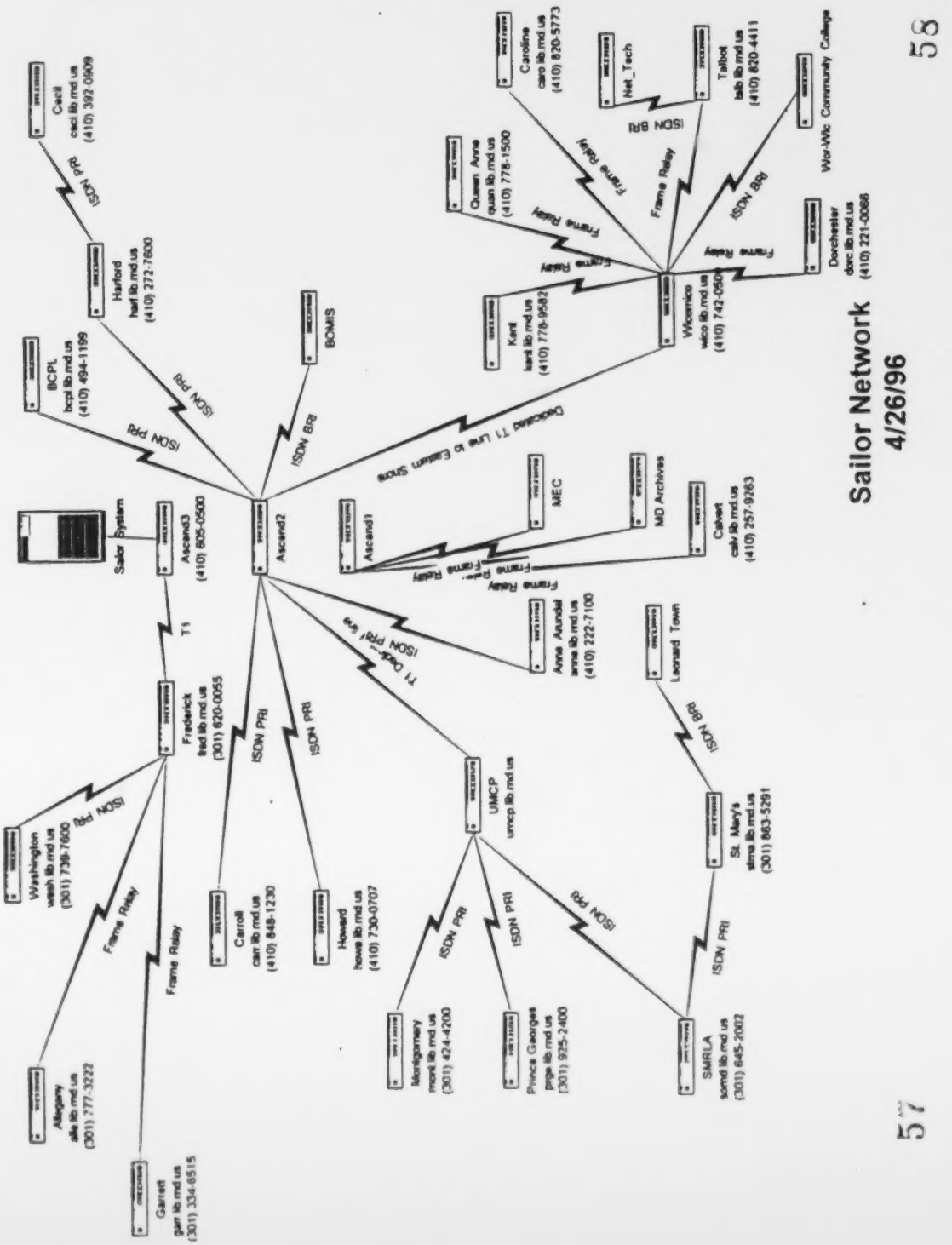
- *Additional network support staff*. SOC hired a new network technician, and expanded its Help Desk staff. In the month of March, the Help Desk logged 1,500 Sailor-related calls, of which nearly 500 were received via e-mail (as discussed in the *Sailor Statistics* section).

- *Reconfiguration of technical components to the backbone*. Since these modifications, the Sailor network has operated nearly flawlessly, with a 99.8% up-time.

- *Additional server hardware*. Sailor network use continues to grow. Sailor traffic is up 18% from June 1995. To keep up with demand, SOC continues to add server hardware.

Additional network changes included the removal of the Sailor gopher server as an information content source in June 1996.

Figure 21. Sailor Network Backbone as of April 26, 1996.



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Responding to Unrealistic Expectations

Throughout the study, there was the sense by some participants that librarians and users simply did not understand the complexity and range of issues tied to building the statewide infrastructure to support the Sailor network. Building the backbone shown in Figure 21 required, minimally, negotiation skills with long distance carriers and local telephone providers, the resolution of a range of technical issues to make the backbone function properly, system upgrades in many library systems, and the development of Sailor network-based content. Such an undertaking is large by any organization's standards, but particularly so when considering the small staff of SOC.

Understanding the complexity issue was key for some Sailor network and library system staff. As such, Sailor network administrators were constantly in the process of educating users and librarians about the infrastructure and how it was being built.

Another key issue that developed during this study was that the already thinly-stretched SOC staff was stretched further by state agency technological needs and demands. State agencies received a mandate to provide WWW-based services by December 1996. In addition, the Maryland Electronic Capital (MEC) project -- a project to connect the Maryland legislature to the WWW -- began. SOC, essentially Maryland's government-based leading Internet experts, provided numerous hours of technical support and assisted in physically connecting agencies and the MEC to the Internet (in fact, Sailor housed many state agency home pages as of this writing). SOC, therefore, became the state's Internet help resource, as well as providing assistance to Sailor network-connected entities.

Sailor Content and Services Issues

Sailor as Maryland's Community Network

Participants noted that in areas throughout the state, there were few community networks as had evolved in other states. Participants attributed this to the fact that the Sailor network had become the defacto community network for the state by allowing [encouraging] local information resources and services to be developed on the Sailor network.

Participants saw this phenomenon as one of the most important aspects of the Sailor network. As such, participants stressed the value and need in continuing to develop state and local government and unique community information resources and services on the Sailor network. Such services, participants felt, would make the Sailor network an invaluable resource to the communities they served.

Centralized Versus Decentralized Content/Services

An issue identified in the data collection activities was what Sailor network content and services are best provided by a central entity [DLDS, SOC] versus what

are best provided at the local library system/community level. The difficulty to resolving this issue is in defining the network content and services as statewide public goods as opposed to the content and services of regional and local interest. For example, a local library special collection may serve the needs of the community, but through digitization, could in fact become a statewide resource.

Participants did, however, point to the following as network content and services that require a statewide approach through the Sailor network:

- Inter-library loan
- State agency and archival documents
- K-12 curriculum modules
- Access to on-line databases (e.g., Dialog, Carl Uncover) and encyclopedias (e.g., Groliers)
- State agency services (e.g., license applications).

Local library system and community information content and services centered around specific library holdings, local government proceedings and services, local school district information (e.g., student homework), and various community group activities.

Participants also indicated that centralized information content and service candidates are those that DLDS could bring to bear economies of scale. Such services include centralized site licenses for on-line databases and encyclopedias.

Comparing Sailor to Other State Library Networks

With the increasing development of statewide networks and Web sites, the research team developed a Web evaluation script that would permit the comparison of the Sailor Web site to other library-based Web sites in terms of such key criteria as content, navigability, services, and design (the final report *Compendium* contains detailed analysis of this data collection activity as well as the data collection instruments).

For this data collection activity, the research team used a class of 25 Master of Library Science (MLS) students at the University of Maryland College Park in February 1996. The class was divided in two, with 13 students analyzing one of five state library-based Web sites and Sailor through the text-based browser Lynx.[10] The remaining 12 students analyzed one of the five state library-based Web sites and Sailor through a graphical browser (Netscape version 2.0). A total of 50 questionnaires were completed. The differentiation between graphical and text access to the Web sites was critical, as a majority of Maryland library systems had only text-based Web access and the need for graphical access to Sailor was a regular future desire of study participants.

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[10]The five library Web sites included Nebraska, North Carolina, South Carolina, Utah, and Wisconsin. To access these Web sites, point your browser to http://www.state.wi.us/0/agencies/dpi/www/statelib.html

Overall, Web evaluators considered the Navigability (70%), Quality of Content (68%), Quality of Hotlinks (58%), and Quantity of Information (58%) of all six investigated Web sites to be excellent (see Figure 22). As Figure 22 also shows, a majority of Web evaluators considered the Design and Services Provided by the Web sites to be excellent or average, with 80% and 68%, respectively. Interestingly, the Web evaluators were nearly evenly split between excellent, average, and poor ratings of the Quality of Help available on the Web sites, with 26%, 32%, and 32%, respectively.

The Sailor Web site, whether accessed through graphic or text browsers, ranked more highly than the other Web sites in all aspects of the evaluation criteria (see Figure 23). Of particular interest is that the Quality of the Content of the Sailor Web site was perceived to be greater (91%) by evaluators accessing the Web page graphically rather than through Lynx (79%). Conversely, evaluators found that the Sailor Web site had a higher degree of Navigability (91%) when accessed through Lynx than graphically (83%). Follow-up interviews with the evaluators suggest that graphics are more appropriate for "surfing" and exploratory activities, whereas when the information desired is known (e.g., to answer a reference question from a known source), graphics are not necessary and even seen as a hinderance at times.

Overall, therefore, the Sailor Web site received a favorable -- excellent -- rating as compared to other state library Web sites. Such data indicates that the Sailor Web site, in terms of such aspects as Quality of Content, Quality of Information, Services Provided, Design, Quality of Hot Links, Quality of Help, and Navigability, surpasses that of other state library Web sites. Readers should remember, however, that the assessment of the Web sites presented here are valid as of March 1996. By their nature, Web sites are continually updated for content and layout and, as such, change over time.

Figure 22. Overall State Library and Sailor Web Site Ratings.

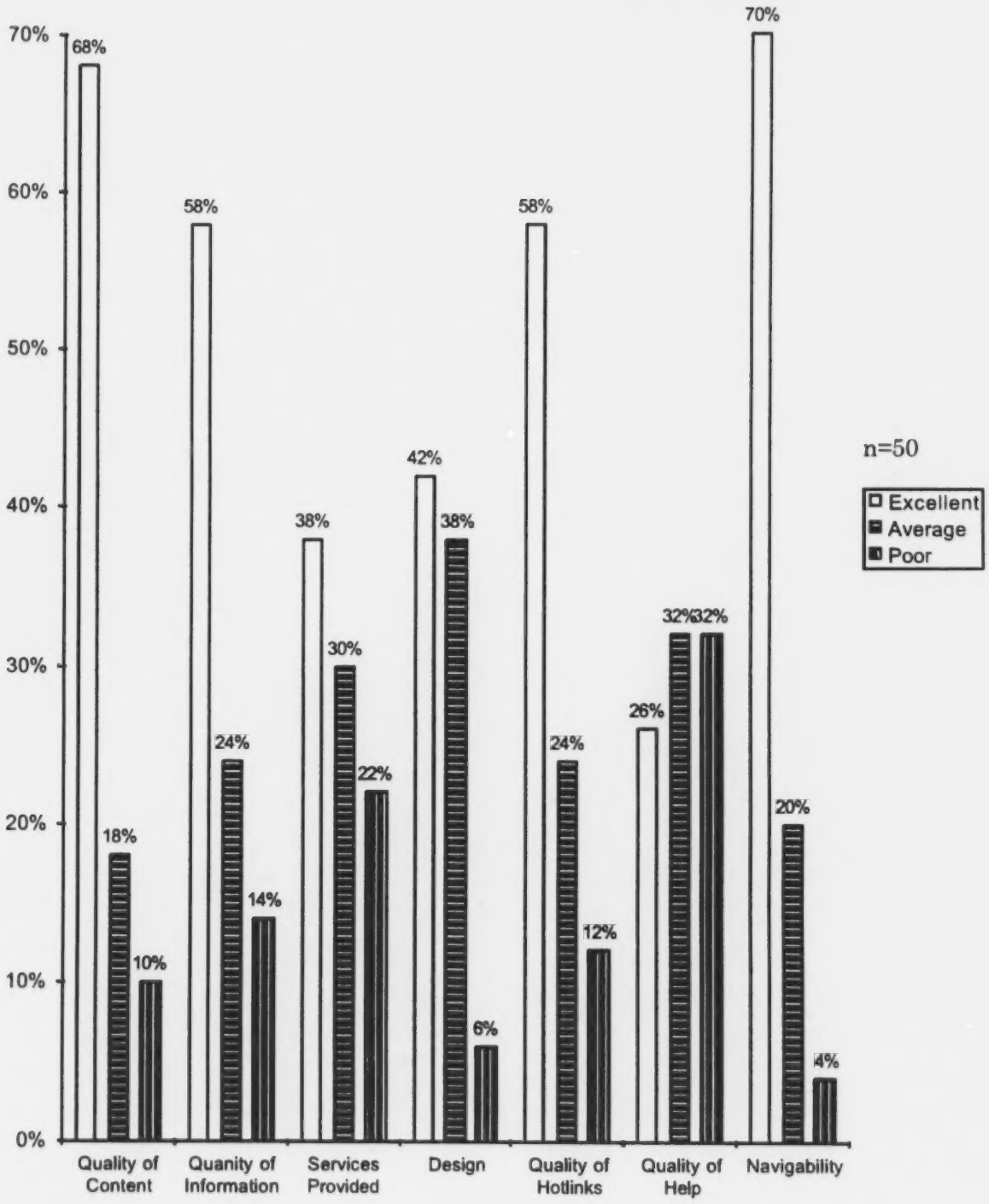
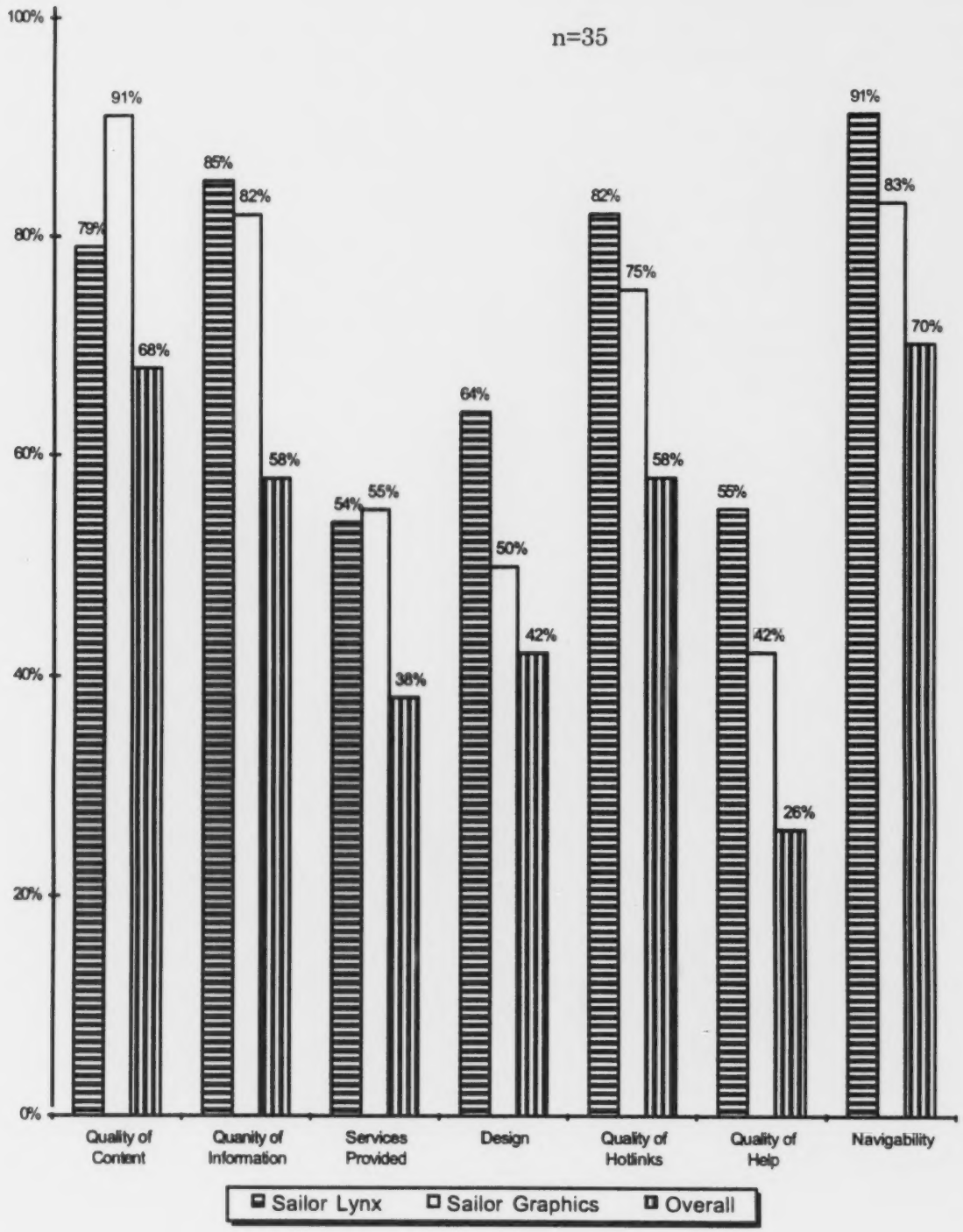


Figure 23. Sailor Network Web Site "Excellent" Rating.



Training and Support

The topic of training on Sailor network content, services, and general connections was continually raised. Participants extolled the need for solid baseline training on Sailor with continual and frequent updates. There are three issues with training: (1) Updating the skills of organization personnel (e.g., public and academic libraries, K-12 staff and teachers); (2) Providing training to community organizations (e.g, schools, local government) and library patrons; and, (3) Instituting continual improvement training sessions that factor in the continual changes to the Internet in general and Sailor in particular.

These findings were corroborated through a survey of Sailor Master Trainers[11] conducted by the research team during April 1996 (see the final report *Compendium* for survey details). A total of 105 surveys were distributed to Sailor network Master Trainers and 66 were returned, for a 62.9% response rate. Of the respondents, 45.2% were school media specialists, 32.3% were Other (e.g., academic librarians, higher education staff), 19.4% were public librarians, and 3.2% were K-12 teachers.

Updating the Skills of Organization Personnel

Study participants found that the proliferation of the electronic networked environment, and its introduction throughout their respective organizations, required new skills -- such as computer and network literacy -- for organization staff. In some cases, these new skill requirements were seen as necessary for the future survival of the organization; in others, these skills were viewed as necessary to keep up with community demands.

Interestingly, study participants did not find that the Sailor network forced new roles on their organizations -- public libraries were still in the business of serving as community-based information gateways, schools were still in the business of educating students. Rather, participants stated that the Sailor network added a new means -- and level of complexity -- through which to carry out traditional roles. Master Trainer respondents, for example, found that the three top challenges they faced in providing Sailor network training were adequate equipment (35.2%), adequate training facilities (29.6%), and adequate time to keep up with continually changing Sailor- and Internet-based resources (22.2%) (see Figure 24). As the data indicate, none of the challenges identified by Master Trainers contend with fundamental role changes, but rather concern physical adequacy in terms of equipment, training facilities, and time.

[11]DLDS initiated a Master Trainer program through which to train public librarians, school library media specialists, K-12 teachers, and others on the use of the Sailor network. The intent of the program was to have the Trainers go back into their communities to conduct Sailor network training seminars for various user constituencies. A total of 105 Master Trainers were trained through two different Master Trainer sessions as of April 1996.

Figure 24. Sailor Network Training Challenges Identified by Master Trainers.

Sailor Network Training Challenge (n=66)	Percentage Challenge
Adequate Training Equipment	35.2%
Adequate Training Facilities	29.6%
Adequate Time	22.2%
Reliability of Connection	7.4%
Access to Sailor Network	5.6%

Providing Training to Community Organizations

Participants identified providing Sailor network-based training to community organizations outside the public library setting as key to the success of the Sailor network. Participants realized that for Sailor to become a community and statewide resource, the network's user base needed to be as broad as possible and extend beyond the public library setting. Many library systems were in the process of initiating training programs that reached out to the K-12, business, and local government communities -- a process facilitated through DLDS' Master Trainer program.

DLDS intentionally instituted the Master Trainer program to extend the Sailor network use beyond the public library systems by including K-12, business, and government representatives in the training programs. As indicated earlier, a substantial percentage of the Master Trainer respondents, 45.2%, were school media specialists -- an indication of the diversity of the Master Trainers.

In all, Master Trainers provide training to library staff (69.7%), teachers (69.7%), students (51.5%), library patrons (28.8%), and other (28.8%, e.g., parents, business leaders, and government officials) (see Figure 25). Overall, the mean training class size is 10.8 individuals, with a range of 1-40 individuals, and on average, Master trainers have trained 100.9 individuals each, with a range from 1-500 (see Figure 23). Master Trainers offer courses on the general use of Sailor (92.4%), technical training (e.g., hardware/software skills) (66.7%), special topics (e.g., K-12, business) (34.8%), Internet navigation (18.2%), and other (13.6%) (see Figure 25). Master Trainer-taught courses are predominantly offered 1-2 times per week with 47.4%, followed by none per week with 38.6%, more than five times per week with 8.8%, and 3-4 times per week with 5.3% (see Figure 26). It is interesting to note that the Master Trainers are nearly evenly split, 48.3% to 46.7%, as to whether they anticipate the number of courses they offer per week to remain the same or increase within the next 12 months. Only 5.0% of the Master Trainers anticipate a decrease in the number of courses they offer within the next 12 months (see Figure 24). Master Trainers indicated that they provide training in several locations, including schools (62.1%), public libraries (30.3%), other (e.g., government buildings) (30.3%), and community centers (3.0%).

Figure 25. Master Trainer Types of People Trained and Types of Classes Offered.

Types of People Trained (n=66)	Percentage Trained	Types of Training Classes (n=66)	Percentage Class
Library Staff	69.7%	General Sailor Use	92.4%
Teachers	69.7%	Special Topics	34.8%
Students	51.5%	Internet Navigation	18.2%
Library Patrons	28.8%	Technical Training	66.7%
Other	28.8%	Other	13.6%
Mean class size = 10.8, range 1-40; Mean number trained = 100.9, range 1-500.			
Percentages do not total to 100.0% as Master Trainers were asked to indicate all the types of people and topics for which they provide Sailor network training.			

Figure 26. Master Trainer Current and Within Twelve Months Number of Classes per Week.

No. of Classes/Week (n=66)	Percentage Offered	No. of Classes/Week in Next 12 Months (n=66)	Percentage Classes
1-2 classes/week	47.4%	Remain the same	48.3%
3-4 classes/week	5.3%	Decrease	5.0%
5 or more classes/week	8.8%	Increase 1-2 classes/week	35.0%
No classes/week	38.6%	Increase 3-4 classes/week	6.7%
		Increase more than 4 classes/week	5.0%
Mean time spent training = 6.0%, range 0.0%-25.0%.			

The data indicate, therefore, that the Master Trainer program is reaching out to various community-based organizations and providing a variety of Sailor network training classes. It is unclear as to the extent to which the Master Training program will expand in terms of the number of trainers and training curriculum over the next year. The expansion/lack of expansion of the Trainer program and curriculum can have a substantial impact of the promotion of the Sailor network beyond the library community.

Instituting Continual Improvement Training Sessions

A major concern of study participants was that Internet training in general and Sailor network training in particular were not one-time events. Rather, in order to maintain proficiency in the Internet and Sailor, participants realized the need for on-going training sessions for community and staff alike. As such, the training burdens on, for example, the Master Trainers, would only increase due to the training needs of first-time users as well as those users returning for "refresher" courses.

Participants, however, lamented the capability of their organizations to keep pace with their own one-time training needs, muchless the one-time and on-going training needs of their user communities. This situation is further exacerbated by the fact that over half of the Master Trainer respondents indicated that the number of their training classes will either remain the same (48.3%) or decrease (5.0%), indicating that current training shortfalls will only increase (see Figure 26).

Of further interest is that Master Trainers, on average, spend 6.0% of their time on Sailor network training activities (see Figure 26). Participants acknowledged that Sailor network and Internet training is a full-time need. The reality, however, is that the Sailor training functions are being staffed with individuals taking on the training responsibility *in addition to* regular duties. Such an approach to Sailor network training will not adequately serve, as participants indicated, the larger training needs of the various community users.

Benefits from the Sailor Network

Participants were able to identify a number of benefits and accomplishments of the Sailor network that included:

- Promotes positive public visibility for libraries as leaders in providing access to electronic information.
- Makes a new range of information resources available to both librarians and the public.
- Provides Maryland citizens with free, universal access to electronic information and encourages a level playing field of equal access to electronic information regardless of geographic location within the state.
- Pushes library systems and staff into better and more innovative uses of the Internet and related technologies.
- Facilitates resource sharing and access to unique state and community resources that otherwise might not be available to all libraries in the state.
- Offers a powerful model for how the library can be a key player and leader in the local community.

- Improves communication within the library and across libraries through the use of e-mail.
- Provides a vision that attracts new resources that otherwise might not go to the library community.
- Provides citizens with remote access to both their local library and library resources across the state.
- Organizes statewide information resources for better access and use.
- Provides a statewide communications infrastructure (backbone) from which a range of resources and services can be made available.
- Shows the importance of librarians and their role as intermediaries to provide access to these sources to the public.

Participants pointed out that because of the different circumstances of different libraries in the state, benefits varied considerably. For example, in Montgomery County a comprehensive information infrastructure is being developed with impetus for the county to make services and information available via Web pages. This is not true in a number of other counties.

Overview

The topics and issues identified by the study team have a number of common themes including: management and governance of Sailor, funding and costing data, training, reliability of the technical infrastructure, appropriateness of Sailor network content, need for a GUI, importance of working with local and county officials to enhance access to local government information, and improving the marketing/publicity of the Sailor network. In addition, there was wide agreement on the range of benefits and usefulness of the Sailor network system. A number of participants stated (in one way or another) that "it is very impressive that such a system has been built in a relatively short period of time."

Clarification of Sailor goals and objectives, better and clearer governance of the network, and more direct involvement of Sailor network management by the libraries are all key issues that will affect the development of the next phase of Sailor. To some extent, participants in the various data collection activities wanted more clarification and direction regarding the development of the network. There was a sense that NOW is the time for this clarification to occur, to set in place a plan for the next phase of Sailor network development, and to marshall the resources to do so.

DEVELOPING A VISION FOR SAILOR

A primary purpose of this assessment project was to provide input that guides the future development of the Sailor network. To do this, there is a need for an overall vision for the Sailor network. At a MAPLA meeting attended by the study team in April 1996, MAPLA members identified components that could comprise a vision for the Sailor network (additional information regarding this meeting is available in the final report *Compendium*). This section presents candidate vision components.

Respondents identified one aspect of a vision for the Sailor network as most important with eight mentions:

- Is a means for encouraging a level playing field by providing Maryland residents with universal, free, and equal access to electronic information.

Ranked next in importance as candidates for part of a Sailor vision statement were the following components with three-five mentions each:

- Has a reliable and state of the art information infrastructure.
- Promotes access to and use of state and local government information and services in new and innovative ways.
- Includes a simple yet effective interlibrary loan component where librarians and users can obtain resources from any library in the state.

Finally, there were a large number of possible Sailor vision statement components that received one or two mentions each by respondents:

- Promotes decentralized administration with more local control of network management and funding.
- Is easy to use and accessible by everyone in the state.
- Offers a statewide catalog of all library and K-12 school/media holdings.
- Is a platform for Maryland libraries to provide opportunities for collaborating with government agencies, businesses, other libraries, and other organizations.
- Is tool that promotes the economic development of both the state and the local community.
- Is affordable for libraries in terms of the information services it provides.
- Continues to be a national leader and innovator as a statewide network providing electronic information and services.

- Leverages statewide access to expensive or otherwise unique information resources so that all libraries do not have to purchase or license these resources individually.

- Links public libraries to other types of libraries in the state and encourages new and innovative types of collaboration.

Each of the above statements could be considered as candidates to be expanded and refined as part of a vision statement for the Sailor network.

As a vision for the Sailor network is developed, Sailor network-affiliated groups need to find the best way to move Sailor in the direction of that vision. There are numerous ways though which to guide Sailor. The next section identifies and defines several models for the future development of Sailor.

FUTURE SAILOR DEVELOPMENT MODELS

A key component to the Sailor network assessment project is to consider the future of the Sailor network's development over the next two-three year time frame. The data collection activities engaged in by the assessment team identified a variety of areas in which Sailor network services (e.g., backbone and content) were considered outstanding, required enhancement, or did not exist. The assessment team incorporated this feedback into alternative operating models for the future of the Sailor network. As Figure 25 shows, each of these models has tradeoffs and implications for the future development of the Sailor network in terms of such network components as content/service control, infrastructure support and development, and governance. The models, therefore, require careful and comprehensive analysis.

The Local Partnership Model

Community-based networks continue to develop and evolve in this country. There are many approaches to community networks, of which the most well known is the Free-net (e.g., Big Sky, Cleveland). A more recent approach to local networking is that of various community constituencies, organizations, and stakeholders working together to create a broad-based community network.

In this model, Sailor evolves into a series of interconnected local community networks with collaboration among local governments, public interest groups, the library system, local schools, and other local groups. The public library serves as the network hub and assists the other participating groups to mount information services. The library also helps to organize the content of the network and ensure content accessibility.

Such a model shifts key Sailor content and network responsibilities away from DLDS and Sailor Operations to the community level. In this model, there is no notion of a Sailor backbone as exists today. Rather, the "backbone" evolves into a patchwork of local networks linked together through technical standards. Each

individual county would be responsible for connecting and maintaining its portion of the network and content.

The Outsourcing Sailor Model

Prior to Sailor, there was no statewide backbone that approached the technical capabilities, innovativeness, vision, and leading edge technologies of the Sailor network in the state of Maryland. The creation of the Sailor backbone was educational to both the public library community and the regional bell companies. The Sailor backbone is now in place, with the public library community having blazed a trail of innovation throughout is creation.

With the Sailor backbone completed, one model of future Sailor development is to outsource the management of the backbone. In this model, DLDS outsources the Sailor telecommunications infrastructure and relinquishes its role as an Internet Service Provider (ISP). By outsourcing the network, DLDS and the library systems can concentrate more on developing content and services statewide -- especially on getting unique state government and other Maryland information/services available on the network.

The Executive Branch Model

The state government is increasing its interest in and emphasis on high technology, education, and attracting new business to Maryland. The current Glendenning administration considers these three components critical to Maryland's future development and growth. Sailor uniquely links the three Administration's goals.

To facilitate the attainment of the Administration's goals, and meet the broader needs of the state, DLDS transfers Sailor to another state agency. Such a move or new home for Sailor could serve to increase Sailor's standing within state government and increase its visibility in non-library organizations. In this model, the Sailor operating budget comes from the state, and not DLDS.

The Declare Victory Model

As of Spring, 1996, all Maryland county library systems have Sailor connections. The Sailor network is operational, stable, and content continues to grow. The challenge to create, innovate, and implement Sailor is over, and Sailor is now moving into the maintenance and future development stage.

Sailor has now reached a salient stopping point. DLDS can, with just cause, declare victory in the development, operation, and provision of a range of networked services to the state. In this model, DLDS continues to operate the network infrastructure but it is now up to the library [and other communities] to decide what kind of content and services they wish to provide, to obtain additional services from ISPs if they wish, and to operate/maintain the equipment in their libraries.

The Hybrid Model

A key issue facing organizations today is that of what services and/or technologies to centralize or decentralize. To achieve economies of scale, create coordinating mechanisms, and facilitate the development of the Sailor network, DLDS centralized the Sailor project through itself, Sailor Operations, and key committees (e.g., MAPLA and the Network Coordinating Council). The future development of Sailor, however, may be best served by a combination of centralized and decentralized Sailor functions.

In this model, DLDS and Sailor Operations develop and centralize a core of Sailor backbone and network services. For example, DLDS becomes a vendor negotiator for all Maryland public library systems for key databases, on-line information services, and telecommunications services. Sailor Operations runs, maintains, and guides the future development of the Sailor backbone. Public library systems can then individually choose what core services it wants from the DLDS "menu," but also have the option of seeking other non-DLDS and Sailor Operations services on their own.

The Public Broadcasting System (PBS) Model

Public television stations function through a collaborative effort involving the Corporation for Public Broadcasting (CBP), independent public broadcasting television stations, corporate sponsors, and public contributions. In this model, large, and generally more wealthy, stations contribute more of their public and corporate sponsorship funding to the CBP than do small stations. Very small (generally rural) and special population stations receive complete funding from the CBP due to their service in underpopulated and underfunded areas. In return for the receipt of station revenue, the CBP provides a basic level of services (e.g., programming content) to participating PBS stations. PBS stations are free to select CBP services and/or provide their communities additional programming services.

In this model, DLDS would serve the same function as the CBP by coordinating the funding, content development, and services of Sailor on a statewide basis. Public libraries, in direct relation to their populations served and revenue sources, would contribute a portion of their funds to DLDS for the provision of a base level of Sailor content and services. Public libraries would be able to augment basic Sailor services to meet the needs of their communities, but there would be a statewide minimal level of Sailor content and services.

The Status Quo Model

In this model, the Sailor network functions essentially as it does now. DLDS manages Sailor development through the distribution of state and federal funding, and Sailor Operations supports and runs the Sailor backbone.

For this model to succeed, DLDS and the library systems need to: (1) Engage in a planning process to develop a future vision for the network; (2) Redefine governance

and management approaches; and, (3) Reach agreement on incremental improvements and changes that could be made with the network.

Each of the above models has tradeoffs in terms of Sailor management, funding, content and service development, and maintenance. Each model also will impact various user communities differently, with some providing for a more equalized statewide electronic information playing field than others. The model choice for future Sailor development is dependent on three key issues: (1) The development of a comprehensive Sailor vision; (2) The resolution of Sailor governance; and, (3) The determination of appropriate centralized and decentralized Sailor functions in terms of network infrastructure, content, and services.

Figure 27 offers a beginning perspective on how to compare and contrast the above models.

Figure 27. Comparison of Possible Sailor Network Models by Evaluation Criteria.

	Sailor Network Model						
	Local Partnership Model	Outsourcing Model	Executive Branch Model	Declare Victory Model	Hybrid Model	PBS Model	Status Quo Model
Evaluation Criteria							
Governance Type/Model							
Content/Service Control							
Infrastructure Control							
Technical Support and Training							
Library Systems Cost							
Services/Content Quality Control							
Degree of Statewide Visibility for Libraries							
Public Accessibility to Electronic Resources							
Statewide Electronic Resource Sharing							

74

75

RECOMMENDATIONS

The previous section offers a number of future development models that can guide strategic planning for the Sailor network. For purposes of illustration, these models are presented as separate scenarios. In fact, aspects of one model can be combined with aspects of other models. Regardless of the model(s) used for guiding the future development of the Sailor network, there are a number of recommendations Sailor network developers should consider to strengthen the statewide network. This section identifies those areas and discusses some specific strategies to consider.

The recommendations are organized within broad topics, but clearly these topics are not mutually exclusive. Thus, recommendations offered regarding governance are related to, for example, recommendations having to do with management. Indeed, some recommendations such as those related to services should be considered in light of recommendations offered in other sections.

We stress the dynamic nature of network development, telecommunications management, electronic services planning and development, and new information technologies. Clearly the current context for statewide network development -- such as Sailor -- is volatile, dynamic, and changing. The factors that were in play during the time when this study was conducted (November 1995 - June 1996) were, in fact, changing as the study progressed. Although we emphasize those recommendations that are more pervasive to the overall success of the Sailor network, readers should remember that conditions and contexts may change and thus, may affect the appropriateness of the following recommendations.

Another factor to consider when reviewing these recommendations is the life cycle of Sailor network development. The researchers believe that the Sailor network is currently in a transition period moving from a "start-up" mode to more of a mature mode of network development. Just as humans transition from infancy to teen age years, to adults, so too might statewide networks. Issues, services, requirements, needs, etc. that take prominence in the start-up effort for the network might be quite different than those in the maturing network. Thus, the recommendations offered below are in the context of the Sailor network's transition from a start-up mode to maturity.

Governance

A clear and consistent governance structure should be established for the Sailor network. To some extent, it may be less important *which type* of governance structure is established than that *one* is established.[12] Despite the best efforts of DLDS, there is some ambiguity across the state as to specific responsibilities for managing the network, determining who is responsible for what, exactly, and providing appropriate communication channels for members of the network and the general public to provide input to and obtain information about the network.

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[12]As stated earlier in the report, a Sailor network governance board has been established. For a membership list, see Appendix C.

Instead of recommending a specific group or structure to serve as the governing body, the body should minimally meet these criteria:

- Represents a larger constituency group that includes libraries, K-12, academic institutions, individuals from the private sector and/or Internet Service Providers, local government, DLDS, and users.
- Develops a formal set of by-laws, holds public meetings, and makes available minutes of those meetings.
- Includes members who are knowledgeable about Sailor, the telecommunications arena, computing, and development of information services.
- Makes recommendations and advises the State Librarian (until such time as the funding changes and primary funding for Sailor comes from sources other than the state library).

It is unreasonable to expect the primary funding source, i.e., the state library, to relinquish all governance to a governing board or the like. Thus, we recommend that the governing board be established in such a way that it responds to the needs of the larger state community and makes recommendations directly to the state librarian. Should the state library, at a later date, choose to divest itself of the Sailor network to some other agency or organization, then the nature of the governance body would also need to change.

In conjunction with the governance recommendations, it is also important to decentralize some responsibilities for network development. While it is clear that a key responsibility of DLDS is maintaining the technology infrastructure (either directly or by outsourcing), individual libraries and local governments/organizations should have additional flexibility and control over the development of local networked information resources and services. Key tasks for the governing board will be to (1) provide guidelines that promote more local control over networked services that are supportive of an overall vision for the Sailor network, and (2) insure that the channels of communication stay open among the various stakeholders.

Management

Establishing a governing board is essential, but there is an important distinction between a governing board and a management structure for dealing with the strategic and day to day concerns of the network. While the governing board should provide a forum to determine policy and provide guidance on how to manage the Sailor network, a clear and understandable management structure should be established at DLDS, or perhaps in another organization, to manage the Sailor network.

While there are a number of possible management structures that can be recommended there are some main components to the management structure to be considered:

- The Governing Board. The Board develops policy, provides a means for discussion and debate for planning and development of Sailor, insures open and effective communication to and with the Sailor network community, and makes specific recommendations for Sailor development to the state librarian.

- DLDS Management Structure. This structure should include one person with overall responsibility for the Sailor network, Director for Sailor Operations, who reports to the state librarian, and has at least two other professionals reporting to this person: one for technical aspects of the network, and one for services, programs, and training. Specific job descriptions should be detailed for each of these three professional positions. Other positions may also be defined as needed.

- Committee Structure. There is a need for a statewide network such as Sailor to have significant involvement and participation from the larger statewide community. The researchers, however, recommend that the existing committee structure be reviewed with an eye toward:

  - Simplifying the existing structure and reducing the number of committees

  - Specifying the roles and responsibilities of the various committees

  - Clarifying to whom the committees report and are to offer advice

  - Expanding the diversity and the degree to which the committee members represent the broad Sailor network community beyond that only of the library community.

- Contracting Services Organization Management Structure. This organization actually operates the network, handles maintenance, insures the reliability of the network, operates a range of support (such as help desk), and responds quickly and accurately to fix network/infrastructure problems. The director of contracting services has a professional and support staff, reports to the state librarian, and works closely with the Director of Sailor Operations at DLDS. The positions at the contracting organization should be clearly defined, responsibilities described, reporting lines identified, and regularly reviewed with the Director of Sailor Operations at DLDS.

While there certainly can be other key components to the overall management structure of the network, these appear to be key.

Throughout these components clear lines of responsibility and authority need to be established and made known to the larger Sailor community. The Director of Contracting Services, the Chairperson of the governing board, and the Director for Sailor Operations at DLDS should meet regularly to review the current status of Sailor network operations and development. Regular reports on the status of Sailor network and outcomes of these meetings should be provided to the state librarian.

The responsibilities and qualifications of the Director for Sailor Operations in DLDS might be modeled after such that can be found with the Executive Directors of regional networks such as NyserNet, CICNet, etc. These individuals typically have a mix of technical skills, management skills, public speaking and presentation skills, business and budgeting skills, and understand the complexities of information technology management in a rapidly changing political and societal environment. Moreover, such individuals have an excellent understanding of the needs of a range of different stakeholder groups, provide a strong leadership stance, and work well with the private and commercial sectors.

The positions under the direct control of the Director of contracting services versus those who report to the Director of Sailor Operations should be clarified in terms of responsibilities, tasks, and qualifications. Arrangements between DLDS and the host contracting organization also should be clarified and formalized -- especially in terms of the expected "in kind" resource support from the contracting organization. The contracting organization must regularly assess user needs, determine the degree to which it is responding adequately to Sailor users, and insure that it presents a "user oriented" perspective on meeting its responsibilities. Finally, to the extent possible, the various management structures, positions, and responsibilities should be made known to the larger Sailor network community.

Vision and Goals

To a large degree, the Sailor network has become all things for all people. That is, many Sailor network participants and libraries have a range of differing expectations for what sailor should be and do. In the previous section we outlined a number of possible models to guide Sailor development that can serve as a beginning discussion point to agree upon future Sailor network directions. A first task for the Sailor network governing board and DLDS is to orchestrate a strategic planning process that results in a vision and set of goals for the statewide network.

The vision and goals for the network must be realistic. Currently, the network is overextended in terms of its ability to:

- Maintain and expand the technology infrastructure
- Provide staff support and consulting to participant libraries and other participating entities
- Meet growing service expectations from users
- Develop and implement new and innovative programs and services
- Market and promote the network
- Obtain adequate funding to grow the network.

If the existing funding situation stays as is (June 1996) for the foreseeable future, choices must be made and priorities must be established in terms of services and

infrastructure support. Sailor cannot continue its current level of accommodation to the various demands being placed on it.

This strategic planning process should be "quick and clean." The reality is that any strategic planning effort will be in a constant "beta-test" mode because of the volatility of networking and telecommunications development in the near future. Nonetheless a subcommittee of the governance body should take the lead in developing a strategic plan. The process should take no more than 4-6 months and participants should understand that the plan will be in a constant state of revision and refinement. There is also a need to recognize that everyone may not agree with the vision and plan. A vision and a plan for the future development of the Sailor network, however, is essential and should include participation from all the key stakeholders.

Funding

There are more needs for Sailor network resources than there are funds available. Overall, primary funding for the Sailor network has come from federal Library Services and Construction Act (LSCA) sources and state of Maryland library aid through the Department of Education. A range of revenue streams should be identified to support the Sailor network other than these two basic sources.

While fund raising is always difficult, efforts should be made to obtain additional support for the Sailor network by such means as:

- Grants and awards from foundations, government, and various research and demonstration efforts
- Partnerships or sponsorships with schools, school districts, and other educational organizations
- Service contracts to various organizations or groups in the state for special customized programs or services
- Fee-based services that originate from libraries or others on the network (these might include charge-back mechanisms for revenue to return to DLDS or the contracting library operating the network)
- Partnerships with Internet Service Providers, software/services vendors, or others in the private sector.

This list is not exhaustive but is intended to be suggestive of new revenue streams for Sailor. Identifying and obtaining additional revenue streams requires staff and resources to develop such streams. Individuals from the governing board, from DLDS, from the larger library/local community and others may be interested in working in this area.

Obtaining adequate funding for the Sailor network presumes the ability to clearly articulate the vision and direction for Sailor. Partnerships with other organizations, proposals to foundations, etc., will require the Sailor network to have a clear and concise "message" of what the Sailor network is, what it hopes to be, and how others' association with Sailor will support that vision. In most instances, funders will want to know what, exactly, they are supporting and how such support will benefit them.

Community Based Services and Programs

Local libraries and governmental agencies should be encouraged and supported with resources and expertise by DLDS to design and implement community based information resources and services unique to that particular community. Sailor can serve as an important gateway to national and global electronic information resources and services, but it cannot *compete* with such services. Thus, Sailor's future strength is likely to come from building and supporting local community services in an electronic environment.

The cornerstones for leveraging local community electronic services over Sailor are:

- Public libraries
- K-12 schools, school libraries, and school districts
- County and municipal governments
- Community groups/associations.

To some extent, the community-based information services and resources are those that are increasingly being provided via community nets or freenets, e.g., Charlotte's Web or the Boulder Community Net. DLDS can encourage and promote such local development, but overall, it will be the decision of local public libraries to move or not to move into local community electronic information services program development.

Sailor network members can investigate new models for sharing and learning from each other regarding the types of networked community services and programs that are developed and implemented. In a best case situation, DLDS might offer a range of consulting support to assist local libraries develop community based networked services. The reality, however, is that Sailor network members will need to share their expertise and knowledge about such services development; they will need to provide others with programs, software, and "good examples" that might be modified for other communities; and the membership will need to organize itself in such a way that such knowledge is made available -- perhaps via some form of a clearinghouse.

The Sailor network, however, provides an infrastructure from which local communities can "attach" community-based services. It may be that even in those instances where the local public library does not provide a leadership role for such activities, other local units such as government or K-12 will. Thus, DLDS should

have mechanisms in place to support local community development, that provide incentives for communities that collaborate across various organizations and libraries to provide networked services, and encourage innovative and new applications of networking at the local level.

Development of Network Content

Related to the above recommendation regarding community based programs and services is the need for more extensive content and applications on the Sailor network. To a large degree, these first years of the Sailor network have had to deal with a range of technology infrastructure issues. As the technology infrastructure becomes more reliable, attention should be redirected to extending and developing the content that is available to users of the network.

There are a number of options to consider as a means of developing more content and applications for Sailor network users:

- License or Purchase Content. In this option the members determine what types of databases, electronic services, or other applications they want (and might be willing to pay for) and they are obtained and made available over the network.

- Produce Unique Sailor Network Content. In this approach DLDS can contract with members to develop specific content and services that would then be made available via Sailor. Unique content typically might be services and resources unique to Maryland or individual systems, e.g., government records or services.

- Hotlink to "Neat" Content. Another approach is to develop a range of subject or topic menus that allow users to hotlink to other Web sites. In this approach, for example, a Sailor network developer might identify a menu (or set of bookmarks) of key medical information resources and services which all Sailor network users can access. Or, the local library could develop the bookmarks primarily for local information needs.

- Share Locally Developed Content. This approach promotes the idea that if a local school, for example, develops a "plug and play" learning module on seventh grade civics, the module can be mounted and shared with other Sailor network members and DLDS.

Regardless of whether these, or other strategies are used, a coordinated plan to identify appropriate content to add to Sailor network should be developed and implemented. The strategies should also consider content or services being offered in a "Tiered Approach" (see below).

In determining appropriate content to put on the network, a combination of the "if you build it they will come" approach and the "ask them what they want" approach will be needed. Many Sailor network users will not know what the possible options might be for services development, thus the need for "if you build it they will

come." On the other hand, the various data collection efforts identified a number of Sailor network users who have good ideas and suggestions for what should be developed and placed on the network.

Tiered Networked Services Provision

One role of DLDS in the evolving Sailor network model can be to offer a series of tiered networked services. For example, DLDS might determine (with guidance from the governing board) that a *core* level of information resources and services include a package of items that all Sailor libraries and users can access. This package might, as illustration, include statewide access to particular databases and services for which DLDS has contracted via a licensing arrangement. Such licensing agreements can leverage the cost to access these databases such that all participants can use the database on a very cost effective basis. Without such arrangements, some libraries may not be able to afford access to the service or database.

A second tier of services, for example, might be *supplemental* networked services also provided by DLDS. These supplemental services, however, would be purchased individually by libraries and other organizations as per their needs and ability to pay. Again, licensing arrangements may reduce the individual cost to subscribers, but the assumption is that for this tier of services, users must subscribe to them and pay some portion of their costs. An example might be a license to a medical database and on-demand medical information service. Those Sailor network participants wishing to subscribe through the central offices of DLDS may do so, those that do not, don't.

Although there may be a number of "service tiers," one type would also be local community services and resources developed by the local library or other local agencies (see above). The governing board may wish to consider the appropriateness of certain types of local services, i.e. community calendars, municipal government information, etc., being openly accessed by all Sailor network participants while other types of locally developed networked services and resources might be subscriber-based. For example, if an individual public library provides a statewide reference and referral network service, accessing and answering a range of Maryland statistical data, they may provide the service only to other subscribers at a certain schedule for services. Such strategies may encourage and would reward those local organizations to develop such services and recover some of the costs for services development and provision.

Tiered services provision can also be applied to the level of network and infrastructure training and support that DLDS or the host contracting organization will provide to members. Clearly, there is a limit to the amount of support, on-site consulting, equipment installation, and training that can be provided. DLDS and the contracting organization may wish to identify and define a set of *core* and *supplemental* services. Core services might be so many hours of on-site consulting per month after which the members would have to pay for supplemental services and support.

There are numerous approaches to employ tiered services provision and costing. At issue, however, is the need for some clarification about which services are provided statewide for free; which services might be subscriber based (the assumption being that it is better to have access to a service and pay for it than to have no access); which might be charged back to various types of user groups, and to determine the types of services that are the responsibility of the local community or local library.

Technology Infrastructure

During the start-up phase of Sailor network development, significant resources and staff time have been dedicated to designing, developing, implementing, maintaining, and managing the hardware, software, telecommunications, and computing components of the network. Indeed, one might comment that DLDS and the contracting organization (Pratt) have been overwhelmed with these responsibilities. The researchers believe that the effort by DLDS and the contracting organization to manage this infrastructure has been impressive (miraculous?) -- to say the least, given the staff resources available to them during this start-up phase. There appears to be two *basic* scenarios available for infrastructure development.

Scenario One proposes growing the network, maintaining and improving the network's reliability, and incorporating new technologies and applications as available. In this scenario, the researchers, however, disagree with some who would suggest that the design, development, implementation, and maintenance will now be much easier and less time consuming since the basic architecture has been created and implemented.

New and evolving information technologies, the ever-increasing demand for more and more band-width, the need to upgrade the network with faster and better equipment, the changing private sector context for obtaining services and support, and increased expectations from users to incorporate "the latest" applications, e.g., interactive color video conferencing, suggest that management of the network infrastructure will continue to require significant commitments and resources. Scenario One requires increased resource support to be successful.

Scenario Two proposes the maintenance of a backbone structure that provides "basic" networking and telecommunications support. Basic support would be defined as much less support and resources than would evolve under Scenario One. Under Scenario Two member organizations would be responsible for acquiring their own networking support beyond basic backbone services and would "hang" their own applications off the basic Sailor network backbone.

This "basic" backbone, however, would become increasingly inadequate for some of the members who would likely migrate to other network support systems. Nonetheless, the Sailor network would continue to provide a "safety net" of access to core information resources and services. Resources needed to support Scenario Two, while less than Scenario One, might still be significant. Eventually, Scenario Two could result in the demise of the Sailor or the creation of a "two class" system of

networked organizations -- those that can afford a high quality network or those that can afford only Sailor.

To some extent a decision to support one or the other of the scenarios is resource dependent. But regardless of the scenario, the researchers believe that DLDS should consider increased outsourcing for the operation and maintenance of the statewide network. While providing "start-up" support and seed money to design and implement Sailor certainly falls within the purview of the state library, one might ask if day to day responsibility for network operation and maintenance is an appropriate responsibility -- and allocation of resources -- for the state library.

Since the Sailor network is a *statewide* network, we believe that minimally, the management and maintenance of Sailor network infrastructure should (1) be increasingly outsourced to other government or private sector organizations, and (2) that the resources required to support Sailor network infrastructure should be contributed by state agencies *in addition to* the state library. The Sailor network has extended well beyond a library network and is increasingly is the *statewide* electronic network for all of Maryland. This development is likely to continue as Sailor matures. The state library will be increasingly unable to have the technical expertise and resources needed to manage, maintain, and grow the network. Outsourcing and a consortium arrangement among government agencies, perhaps, for supporting the Sailor network should be considered.

Successful outsourcing, however, will require DLDS to have better financial information available describing Sailor costs (see below). Once Sailor costs are better understood and described, better assessment can be made as to which parts of Sailor are most appropriate for outsourcing.

The Visiting Sailor Officer (VSO)

To leverage available resources to best benefit the Sailor network, a VSO program could be inaugurated. Briefly, such a program would allow for staff in libraries, K-12, or other organizations to contribute a percentage of staff time to Sailor network-related activities and programs. For example, the director of a library approves a librarian to work two days a week on some specific aspect of Sailor network development -- perhaps fund raising, training, help desk services, etc. For that particular task, the VSO works with DLDS staff or with the Host contracting organization.

The broader Sailor network community needs to have greater "ownership" in Sailor network activities and responsibilities. Rather than holding DLDS responsible for virtually all facets of Sailor network development, the broader Sailor network community should make direct commitments in terms of staff and time through mechanisms such as a VSO to support the Sailor network. Such an approach obviously increases the Sailor network resource base, but it also provides a mechanism for others to learn about Sailor network operations, to share views and suggestions with DLDS and the c acting organizat n, and 44˚ unicate back to the staff's organization "first hand" views and assessments of the Sailor network.

Training

A constant theme throughout the study was the need for ongoing *programs* of training and education related to:

- How to use the Sailor network
- Integrating Sailor network content and services into various educational activities in schools and libraries
- Information technology management and applications
- Telecommunications and network management and applications
- Network services and resources development and management (including Website development, etc.)
- Assessment of networked information resources and services.

The library community, alone, in the state has significant training requirements that are not being met and will likely only continue to grow.

The degree to which DLDS can fulfill the various training and education needs of the statewide Sailor network community are problematic at best. Certainly DLDS can continue to provide training opportunities, but other organizations in the state need to provide direct support and be directly involved in the training issue.

We recommend that a Training Consortium be established as a partnership among the library community, the K-12 community, local and state governments, and other civic groups as appropriate. The goal of the consortium is to coordinate and provide a range of training and educational programs that support the Sailor network. Overall coordination of the Consortium might be accomplished by Training Coordinator employed by DLDS, by the Host contracting services organization, or another organization.

A number of options are available for how the consortium might operate. For example, the Consortium might operate using a "cost recovery" model where a range of training is offered by Consortium members to other members; the Consortium might contract for or outsource specific training programs for its members; members of the Consortium might pay a nominal annual fee to subsidize basic operating expenses for a Coordinator and other support. Regardless of the manner in which the Consortium operates, there is a critical need to improve the technological skills of information professionals -- and Sailor network users -- in the state. One-shot workshops cannot replace a carefully coordinated *program* of education and training.

Management Information Systems (MIS) Development

A recurring theme throughout data collection activities was the need for regular reporting of a range of Sailor network-related data. As an example, the MIS should include data related to network statistics (e.g., traffic flow, document downloads, origin of network traffic) at both the Sailor network server and local library Ascend router levels. These data are critical to meet the needs of state library and public library system resource allocation requirements, infrastructure and personnel planning needs, and budget negotiation activities.

The data presented in the *Sailor Network Usage Statistics* section of this report demonstrate the ability to collect, analyze, and report such statistics. Collecting such data is not without difficulty, and there is the need for the resolution and comprehension of a range of data-related issues. A key issue, for example, is the need for individuals collecting and interpreting such data to understand just what is being counted (e.g., number of server hits), with what level of accuracy (e.g., initiating IP addresses versus "guest" designation), and with what ability to extrapolate (e.g., Ascend router modem saturation -- the point at which callers get a busy signal). These issues and others are discussed in detail in Appendix D (Piper, 1996).

At present, there is no formal mechanism in place for reporting these types of statistics, and independent public library systems cannot access the Ascend routers to collect statistics of their own. The proposed Network Manager needs to establish a monthly formal reporting system that provides DLDS and Library Directors with such data as:

- Sailor network backbone traffic by hour and day of week to inform decision makers of peak traffic periods
- Sailor network server traffic, to include hits on the Sailor home page, document downloads, average connection time, and user activity
- Sailor network help desk statistics, to include number of calls, originating calling area, and nature of call
- Ascend router statistics, to include modem saturation rates, calls per hour, calls per day of week, average connection time, and originating call location (caller-ID).

These reports will provide connected Sailor network entities with important data concerning the Sailor network in general and their respective nodes in particular.

While the above emphasizes network traffic data, the MIS should contain a range of other data such as use of particular types of Sailor network content, financial information, user assessments, etc. Either DLDS or the Host contracting organization should be responsible for such an effort. The lack of a comprehensive MIS for the Sailor network makes strategic planning difficult, limits the degree to which Sailor network developers can assess the quality and performance of existing

Sailor operations, and does not provide a "common base of knowledge" from which the broader Sailor network community can discuss Sailor network activities on a common basis.

Statistics describing networked services will take on increased importance for libraries as users "visit" the library electronically rather than in person. Thus, libraries can expect a decline in on-site services such as reference transactions and can expect increases in electronic provision of such services. Without statistics describing the networked services, governing boards will have an inaccurate picture of the range and extent of services the library provides. In short, individual libraries will need to have in-house procedures for collecting and managing statistics describing networked information services and resources. These procedures should be agreed upon statewide, and local efforts should support and accommodate the statewide efforts.

The data collection activities and various data collection instruments developed to assess the Sailor network as part of the effort being reported here, need to be institutionalized into the Sailor network development and managerial process. A person at DLDS should be assigned specific responsibilities for the ongoing Sailor network evaluation effort and the management of the MIS. The final report *Compendium* provides documentation, instruments, and methods for ongoing assessment of the Sailor network. The resulting data from the efforts must be managed and organized in a MIS so that they can be used for justifying Sailor network expenditures, determining Sailor network components or operations that should be improved, and providing longitudinal data to track Sailor network performance and activities over time.

In short, there needs to evolve a statewide, ongoing Sailor network evaluation process between and among DLDS, the contracting organization, and members. Member libraries and other organizations should agree on procedures and definitions for data collection so that, at least within Sailor, data can be compared meaningfully; a standard set of core statistics can be collected and maintained that describe network services and activities; and regular reporting procedures should be coordinated such that Sailor network members as well as DLDS have accurate and timely information describing the network.

Financial Information

Related to the above recommendation is the need to have better control over identifying network costs and expenditures. It is not clear to the researchers what the total expenditures are for the Sailor network although budgeted amounts from LSCA and from the state can be identified. At issue is determining the degree to which "in-kind" or other expenditures that support the Sailor network are being made by Pratt (as the Host contracting organization) and perhaps other organizations that are members of the network.

In short, it is very difficult to determine that *actual* cost of operating the Sailor network. The researchers suggest that actual costs are well beyond the budgeted amounts provided through LSCA and state aid. It is to the benefit of the Sailor

community to be able to identify real costs and expenditures to maintain and operate the network. Such benefits include:

- Clarifying what organizations, specifically, are contributing what resources, specifically, to Sailor, in terms of hardware, software, training, telecommunications, etc.
- Identifying the degree to which some members may, in fact, contribute excessive resources to the network given the benefits they receive.
- Being able to link actual costs with the resultant benefits that the state library, local libraries, K-12, and other users receive.
- Supporting an accurate planning and budgeting process for future Sailor network development.

During the study, a number of individuals commented also on the usefulness of being able to "hide" the actual Sailor network costs or otherwise (usually for political reasons) to be able to provide creative accounting techniques to come up with cost numbers that "fit the need." The researchers believe that the benefits of having reliable and accurate cost data outweigh most benefits from creative accounting.

The researchers recognize that this recommendation will require some effort to develop procedures and policies that identify, define, and assess the degree to which a cost contributes to the overall network as opposed to individual organizations. This effort, however, is essential for a successful MIS as well as for simply having the cost data in an organized and meaningful fashion. Nonetheless, such an effort is important and should be supported by both DLDS and the Sailor network membership.

Marketing and Publicity

Marketing is the effort to promote and inform target audiences about the nature, use, and importance of a product or service. Publicity is insuring that the target audience receives regular -- and hopefully positive -- current information about the network. When there is confusion or disagreement about the vision and goals of Sailor, and when the governing and management structure is ambiguous, it is difficult to launch an ongoing marketing and publicity strategy. In one sense, Sailor has been successfully marketed to the state as an electronic means to access library and related information. This important message, while certainly appropriate in a start-up mode will need to be refined as Sailor continues to mature.

Depending on the type of service model selected for the Sailor network's future, and depending on the vision and goals that are selected, a marketing plan should be developed by DLDS and Sailor network members and approved by the Board. At issue here is to answer the question: What are the most important images of Sailor that the public should have? Then, a marketing and publicity strategy is put in place to promote those images. Since some might question the appropriateness of a state agency like DLDS doing "marketing" and "promotion" the staff responsible for

these efforts might be better located in the Contracting organization, in a member library, or be a committee of members.

Communication

Improved and regular communication among DLDS, member libraries, the Contracting organization, users, local government, K-12, and other groups is essential for the health and development of Sailor. Implementing some of the recommendations identified above regarding management, vision and goals, marketing and publicity, etc. will provide a basis for better communication and more accurate information about Sailor to all concerned.

Currently, there is a need to improve the availability of timely, consistent, and accurate information about Sailor network activities. *The Spinnaker* is a short newsletter published every two months by DLDS providing "news and updates from Maryland's Sailor Project." In addition to such efforts, organized files of help information, previous guides or announcements, and other Sailor network program or technical information should be made available in an easy to access and use fashion.

Central to improving communication among the various groups is that DLDS and the contracting organization are organized and has agreement on priorities, issues, strategies, etc. Although it is possible that the number of communication mechanisms might be increased, the researchers believe that the coordination of these communication mechanisms and having similar content appear from these mechanisms may be more important than the number of communication devices. An electronic archive of minutes of meetings, key documents such as vision statement, governing board by-laws, etc. would contribute to having a common knowledge base for the Sailor network. In addition, the "official" statements of the Sailor network should go through some formal process of review to insure consistency in content.

CREATING SAILOR'S FUTURE

Those responsible for shaping the future development of the Sailor network have an unparalleled opportunity to continue the tradition of being the leading edge statewide network. The state library made a conscious decision to provide the residents of Maryland with an innovative statewide network that could connect those residents, equally, to electronic information resources and services. The library systems also played a critical role in supporting the development of the network and in being the main link between the residents and Sailor. Many others also contributed to the success and utility of the Sailor network as well.

Sailor network developers might best think of 1996 as the transition year from a start-up mode to one more of a refining, coordinating, programming, and managing mode -- in short, developing a more mature Sailor network. In making the transition from start-up mode to a more mature network a number of key factors might be kept in mind:

- Statewide networks, such as Sailor, need to evolve and develop with some freedom, flexibility, and in such a way that it can be "fleet-footed" in taking advantage of opportunities; yet this flexibility should be lodged in a broader framework of vision and management that sets a context for such development to occur.

- Sailor is rapidly evolving into a *statewide* network that includes a range of stakeholders well beyond that of the public library community; growing pains to incorporate those other stakeholders in the financing, operation, and development of Sailor are likely to occur. But a broader constituency and base of support throughout the State for Sailor will contribute to its overall health and development.

- Although we have consistently made recommendations for the Sailor network to clarify its vision, to not be all things to all people, and to engage in formal planning, Sailor should not become a slave to vision, goals, and objectives. While a clear management structure is obviously needed, the structure must promote innovation and risk taking -- and be ready to change strategic directions rapidly.

- There is a history of strong public library systems and leadership in Maryland. But there is also an understanding that in networking and resource sharing, "the whole is more than the sum of its parts." As the Sailor network matures, libraries -- and other organizations -- must continue to leverage scarce resources in a networked environment and work together to benefit the state. In the networked environment, no organization can afford to "go it alone."

These factors might best be summarized as "successfully managing ambiguity." And indeed, DLDS, the contracting organization, and member libraries and other organizations associated with the Sailor network will need to continue to cope with significant ambiguity as it evolves.

In the life cycle of statewide network development, efforts such as Sailor must deal with libraries and other organizations that are very sophisticated in their networking, computing, and telecommunications skills, *and* Sailor must also deal with libraries and other organizations that are just beginning to use networks, access Sailor, and understand the nature and types of services that can be provided. In between these two extremes are a range of additional organizational contexts and perspectives.

A key challenge for the Sailor network and its member libraries and organizations will be to recognize and respond to these different organizational contexts in different ways. As such, the Sailor network is, indeed charting new waters and is, itself, constantly evolving and developing. Given this dynamic context, for both Sailor and the member libraries and organizations, the Sailor network community will need to better communicate both with itself, as well as with other groups in the larger state setting. Communicating what the Sailor network is, what it does, why it is important, how it can be best used, and how it can be more effective and successful is a responsibility for the larger Sailor network community and not one particular group.

In the final analysis, this evaluation of the Sailor network finds the network to be an outstanding example as one of the most innovative and successful statewide networks in the nation. Sailor is healthy and evolving, but it faces a number of growing pains as it leaves adolescence and moves into being a more mature and successful network. The issues and recommendations discussed in this report provide a chart for dealing with those growing pains. The *Compendium* to this report provides detailed information on methods and data collection instruments to continue to gauge and assess the health of the Sailor network. Addressing and resolving the issues and recommendations listed here will be a key step to insure that the mature Sailor network continues to evolve and takes a leadership stance for others to follow as they, too, build statewide networks.

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Appendix A - *Seymour Plan* Vision Statement

The State Library Network Coordinating Council's "Vision Statement" for
The Seymour Plan - May 1991

THE MARYLAND INFORMATION/LENDING SYSTEM: * ELECTRONIC DOORWAYS IN MARYLAND'S LIBRARIES IN THE YEAR 2000

A scenario of what the Maryland Information / Lending System will do:

Helen's father needs to start kidney dialysis treatment soon. While the doctor has provided some information, the family wants to understand the treatment more and needs specific information about dialysis centers, as well as the costs and whether federal or state agencies pay any of them. Someone also told her that there are some tax breaks for which he might qualify.

She dials into her local public library's on-line system. The screen menu offers her choices of searching the local catalog of materials, a statewide information and referral directory, and the Maryland Information/Lending System (MAILS(* which provides access to the indexes and some specialized databases in libraries across Maryland.

First her searches the local library's catalog for recent books on dialysis treatment and, identifying one that looks appropriate, places a request for it. Next she asks to search the periodical database, so she can find some articles, especially any that might help the family understand what to expect with this new situation. She identifies two possible articles in consumer health magazines; she places a photocopy request for them.

The Information & Referral Directory is her next search. Following the system's questions about her information need, she is able to print out a list of dialysis centers within 10 mile radius of her father's house. The list includes phone numbers and contact persons.

She starts another I&R Directory search about state/federal funding of dialysis treatment. Through the facilitation of the system, she retrieves summary information about how Maryland dialysis patients' costs are paid. She prints out the text, including the telephone number of an agency that is designated to answer question about costs and to refer people to the appropriate agencies to apply for payment or reimbursement.

Finally, she asks to search a federal services information database and checks for tax benefits for dialysis patients. The system give her a summary, in lay language, of the relevant tax law, with citations. She prints out the text.

Helen likes using MAILS through her local library. It doesn't require her to have special searching skills or any particular ability to deal with computers. She can put her inquiries in her own words, which the computer is able to relate to the numerous indexes it uses. Her visit to the library this evening has given her enough information to start dealing with this new family situation.

* The name **MAILS** was dropped in favor of **Seymour**.

Appendix B - Sailor Network Funding Expenditures Summary

State Fiscal Year 1994/Federal Fiscal Year 1993

Library Services and Construction Act	
Title I	
Project Backbone (Telecommunications Network)	$ 265,042.00
- hardware, leased lines, other set up costs	
Title III	
Project Backbone (Telecommunications Network)	$ 366,758.00
- hardware	
Subtotal	**$ 631,800.00**

State Fiscal Year 1995/Federal Fiscal Year 1994

Library Services and Construction Act	
Title I	
Project Backbone (Telecommunications Network)	$ 300,000.00
- hardware, leased lines, other set up costs	
Sailor Operations	$ 139,077.00
- personnel and related costs	
Telecommunications Network and Some Sailor Operations Costs	$ 110,000.00
Sailor Training	$ 24,067.00
- Trainer/consultant, facility	
Sailor Interlibrary Loan System Purchase	$ 166,427.00
Carroll County Webserver	$ 122,806.00
Title III	
Maryland State Archives Sailor Project	$ 35,650.00
Subtotal	**$ 898,027.00**

State Fiscal Year 1996/Federal Fiscal Year 1995

Library Services and Construction Act (as of April 1996)	
Title I	
Sailor Operations	$ 150,000.00
- Personnel	
Sailor Telecommunications Network	$ 16,145.00

- Telecommunications lines and equipment	
Sailor Training	$ 8,579.00
- Mailings, training facility rental, printed manuals	
Title III	
Sailor Telecommunications Network	$ 128,222.00
- Hardware, Telecommunications line charges	
Sailor Assessment Project	$ 80,000.00
- Project evaluation	
Sailor Commercial Databases	$ 150,000.00
- License for statewide access	
Subtotal (LSCA)	**$ 532,946.00**
State of Maryland	
Enoch Pratt Free Library Appropriation	$ 250,000.00
- Sailor telecommunications network line costs, Internet	
license, and hardware maintenance	
Subtotal (State)	**$ 250,000.00**
TOTAL SAILOR EXPENDITURES	**$ 2,312,773.00**

Appendix C - Sailor Network Governance Board Membership (as of July 24, 1996)

Preston Dillard
DBM/Telecommunications Division

Agnes Griffen
Montgomery County Department of Public Libraries

Brian Help
Anne Arundel County Public Schools

Deborah Leather
Cook Library, Towson State University

Sharan Marshall
Southern MD Regional Library Inc.

Davis McCarn
Citizen

Jayne Moore
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Appendix D - The Piper Latter: Making Sense of Web Usage Statistics

The PIPER Letter: Users and Usage

Features and Special Reports

Making Sense of Web Usage Statistics

By Dana Noonan

Table of Contents

- **Introduction**
- **What's wrong with counting hits?**
- **Usage logs and what they reveal**
- **The not so mysterious numeric domains**
- **Sources of log analysis software and services**
- **Case Study: Tailoring log analysis software**
- **How to set up your web site for log analysis**
- **Should you make your web statistics public?**
- **On the Drawing Board: Proposals for Improving Web Statistics**
- **Summary**
- **Reference Links**

Introduction

One of the hottest topics in advertising and marketing today is how to track Internet usage - especially world wide web usage. More than idle curiosity drives marketers to ask: Where do people go online? How long do they stay on a particular site or page? What software are they using? Where do they get Internet access? In order to promote and sell commercial services ranging from publishing to brandname ad placement, marketers need verifiable statistics on how folks actually operate online. A quick survey of recent treatment of the topic reveals:

- The **Magazine Publishers Association** offers a set of **guidelines** for recording web usage.
- **Newspaper Association of America** publishes a detailed article on the problems related to tracking usage.
- *Advertising Age* sponsors **interACTIONS - Web Sites and Statistical Authentication Forum**.
- Print articles appear in everything from *Adweek* to *American Banker* about new web site auditing initiatives, software that goes beyond counting hits, and even online IDs for electronic commerce.
- The new books and magazines devoted to web-publishing and web-marketing appear almost weekly.
- Public Television's Frontline airs **High Stakes in Cyberspace**.

The Government Perspective

Most of what is available in print or online about web usage statistics is from the marketing perspective. Much of it does not apply to government sponsored sites, because it is based on the premise that *if you can't audit hits and analyze audiences, you can't charge advertisers.*

Government agencies already know a lot about the audience for their web sites: citizens, vendors, government employees, lobbyists, media, and activists. The design of many government sites reveals a clear understanding of the audience that is likely to be interested in the information available on the site.

- Employment departments typically include information of value to both job-seekers and job-providers.
- Health departments often serve many audiences:
  - Citizens needing up-to-date material on AIDS, flu shots, or pre-natal care.
  - Professionals needing information on new regulations or certification requirements.
  - Activists interested in the status of initiatives to provide low-cost universal health care.
- Economic development agencies and tourism offices strive to meet the needs of both public and private organizations offering services and individuals who could use of those services.

Government web sites are best seen as adjuncts not replacements for other government publishing activities. They are often the product of a collaboration of staff members with a technical, publication, library, or research backgrounds. Although the web designers are breaking new ground, the needs and interests of the audience to be served are familiar and well-known.

Why government agencies should be interested in usage statistics

If the agencies know their audience so well, why should they care about something as technical and - admit it- dull as usage statistics?

- **Accountability:** If you spend taxpayer money, you have be ready to show that you got something of value in return. Creating and maintaining a web site requires staff time, hardware and software purchases, and, perhaps, contracts with outside vendors for graphics design, document conversion, or training.
- **Improving service:** If you know what people like to see online, you can tailor your service to meet their needs. If the logs reveal that visitors keep looking for a certain type of material, maybe it should be provided. If the logs reveal that folks spend a minute and are off to something more interesting, maybe it's time to think about adding something like a searchable database or quiz to to keep them a while longer. Folks "surf"

the net for the same reason they switch channels, they are looking for a reason to stop.

- **Reaching new audiences:** We're not in Kansas anymore. Any web site has the potential to reach a world-wide audience. For tourism and economic development offices this is a major attraction.
- **It's fun, if you do it right!** If you look at most publicly available web statistics, they are a nightmare of poor planning. They are often huge files, record meaningless data (who cares how many times a logo graphic is seen, much less a navigation one), include hard to decipher domain names like dragon.ti.com instead of Texas Instruments, etc. Done right they are informative and useful.

What's wrong with counting hits?

A local library had trouble understanding why the sophisticated and expensive mechanism for measuring traffic in and out the of library was showing odd and unexpected counts. Later it was discovered that the night cleaning crew disconnected the counter so they could use the outlet nearest the door.

Web publishers need to both track and profile their users in order to design content-rich systems that will meet the needs of both their organization and the public.

- **Tracking usage** includes finding out how many people visit a specific site, when they visit and for how long, and what pages are popular.
- **Profiling users** involves obtaining typical socio-economic data on the age, sex, income and education of users.

Basic Vocabulary

- **Log file:** Record of all activity on a given web site. There are several different types: access, error, referrer and agent logs. These logs will be discussed later in this article.

- **Visit:** Each time a specific user accesses a page or file is considered a visit. Multiple visits by a single user reflects a high degree of interest in the content and presentation of the site. Frequently updated and popular sites generate multiple visits.

- **Session:** The activities of a user during a single visit is refered to as a session. There is considerable interest in being able to track the length of a session and the path that a user follows within a web site. Since client software doesn't send the server a "good-bye for now" message, it is

difficult to tell just when a session ends.

- **Hit:** The easiest to grasp and most deceptive element in a log file is the record of the number of times a page or file accessed. Hits have gotten a bad rap -- mostly because of the way log analysis programs are misused. Just because each page or image file accessed is recorded as a hit in the log, doesn't mean each page or file should be used by the log analysis program!

- **Cookies and tokens:** Unique session IDs are used by some commercial log analysis programs to track user activities. (See Web User Tracking with the SiteTrack System for a detailed explanation of how this works.)

Usage logs and what they reveal

Traffic logs are just that -- records of who visited a specific Internet site and what they did while they were there. They are intended for system administrators who are understandably leery of having folks wander about their sites undetected.

The number and type of logs on a given system depend on the software used on the system. Web servers may have many different types of logs; the following are the most common:

Access log

All web servers produce access logs (they may have other names) that record visits to web pages. Most web server logs are kept in **common log file** format or can be converted to this format. This format makes it possible for statistics programs to analyze web site activity. Typically, common log entries include:

```
1. Remote host name or IP number
2. User_logname - often not implemented and replaced by "-"
3. Authenticated_user - replaced by "-" if not an authenticated request
4. Date and time
5. Request from client
6. HTTP status code returned to client
7. Number of bytes sent
```

The following items are not part of the common log file format but may be included:

```
8. URL of the page that linked to the page or "_" if not sent by client
9. Software making the request
```

Common HTTP status codes include:

- 200 - OK - successful transmission
- 302 - Redirection to new URL

- 304 - Use local copy from cache
- 4xx - Client error: syntax problem, unauthorized request, "not found"
- 5xx - Server error

The following access log entries show a single session for a user from the Library of Congress (loc.gov). The user requested our State and Local Government on the Net home page (states.html) at 8:57 AM (PST) on November 2, 1995.

```
W36R.loc.gov - -
[02/Nov/1995:08:57:38 -0800] "GET /~piper/state/states.html HTTP/1.0" 200 9964
W36R.loc.gov - - [02/Nov/1995:08:57:38 -0800] "GET /~piper/state/rstate.gif
HTTP/1.0" 200 892
W36R.loc.gov - - [02/Nov/1995:08:57:42 -0800] "GET /~piper/state/new.gif
HTTP/1.0" 200 116
W36R.loc.gov - - [02/Nov/1995:08:57:43 -0800] "GET /~piper/state/redbk.gif
HTTP/1.0" 200 158
```

The following items are not part of the common log file format but may be included: This request generated four "hits" but the only significant one was the one for the HTML file: states.html. This user's browser was capable of displaying graphics so three graphics files were automatically sent: rstate.gif (the headline graphic), new.gif (an attention getter for new entries), and redbk.gif (a red and black line). The access log used "- -" in place of the user's logon and to indicate that authentication was not required. Each requested item was successfully transmitted so the log shows a HTTP status code of "200."

Error log

Although frequently ignored, the error log is an important tool for web management. It tells the story of frustrated users! Note: some servers record errors in the access log.

Referrer log

Referrer logs list the site that a user came from before accessing a particular page. Although these logs may reveal sites that link to your pages, these logs seem a bit too intrusive for government sponsored sites. It's not for nothing that Netscape uses "nosy" as the name for the modules that implement referrer logs on its servers. Most of the highly touted commercial web tracking services and software depend on the referrer log or something like it to produce a better picture of user activities for marketing and ad placement.

Agent log

Agent logs record the type of browser or client software used to access web pages on a particular host.

Most freeware log analysis programs ignore all but the access logs, but commercial

programs often use the error, referrer, and agent logs to provide additional information about how a site is accessed and used.

The not so mysterious numeric domains

A quick glance at the published statistics for most servers reveals a mysterious but ever-increasing number of "unresolved" numeric domains. These are addresses that many log analysis programs can't handle quickly or easily because these sites do not allow reverse domain lookups. In plain English, they won't tell us who they are!

A little background on how Internet domains are set-up may be useful at this point.

Internet addresses include both domain and host information. This is easy to see in the name version: conch.msen.com -- msen.com is the domain and conch is the host machine for some of the services offered by MSEN (an Internet provider located in Ann Arbor, Michigan). Numeric addresses consist of four octets: xxx.xxx.xxx.xxx. The numeric equivalent of this address is: 149.59.6.20.

There are three key classes of network addresses:

- Class A (first octet #127 or less)-- These are the heavy hitters of the Net such as DEC.
- Class B (first octet between #128-#191) -- At present there is a shortage of these network addresses.
- Class C (first octet #192 or greater)

Identifying a particular numeric domain requires contacting Internic and asking for information about the address. The easy way to do this is by running a "whois" search. If you replace the host octet(s) with a 0, you will obtain information about the site. For example, to get information about the 134.84.96.203 address, you would do **whois** search for 134.84.0.0. The 0 (zero) is a placeholder and is not used for a host address. The 203 is just one of the 255 addresses associated with the root numeric address.

	Network #	Host#	Examples	
Class A	octet 1	octets 2-4	16.0.0.0	Digital Equipment Corp.
Class B	octets 1-2	octets 3-4	134.84.0.0	University of Minnesota
Class C	octets 1-3	octet 4	198.108.102.0	Merit Network

Note: Some care must be taken in interpreting the results of these searches.

While it is safe to assume that entries from the University of Minnesota are actually connected with the University in some way, the same cannot be said for unresolved subdomains from many network providers.

So what?

This is all very interesting but what does it mean to you - the webmaster of the Department of ...? First, it means that unresolved numeric domains do not have to be a barrier to finding out about your users. Second, it should influence your choice of log analysis software. If you purchase commercial log analysis software, ask how it handles unresolved numeric domains. If you use one of the many free log analysis programs, check to see if it can be configured to identify at least some of these sites. Third, it means you might want to lobby for supporting reverse domain lookups from your own site!

Sources of log analysis software and services

Ideally web server software should include log analysis utilities that satisfy the needs of both system administrators and webmasters. Unfortunately, the current crop of servers - especially the free or inexpensive variety - lack adequate support for web statistics.

Software Considerations

- What platform will it run on?
- How easy is it to install, maintain and use?
- Is it intended for system administrators or webmasters?
- Can it be customized easily?
- What does it cost? Is there an annual fee?

What do commercial products offer that you can't get free?

Although not all commercial log analysis programs offer all of the following features, they are the most common and the most desirable. Commercial programs:

- Focus on the needs of management, marketing staff and webmasters not system administrators.
- Translate domains, hosts, filenames, etc. into easy to understand plain English.
- Produce general or targeted reports based on user-selected files or directories.
- Group and even cross-tabulate files, visitors, etc.
- Offer report query engines for webmasters and others.
- Track how visitors got to your site by using referrer and agent logs.
- Compress and archive log data.
- Incorporate past report data or compressed logs.
- Provide sleek graphics and tables.
- Generate reports in various formats: plaintext, html, wordprocessor, spreadsheet or database.

At this point most commercial software packages offer more sizzle than steak -- rarely offering more substance than the freeware log analysis programs. However, some programs offer significant advantages in terms of time required to produce reports by automatically generating visually stunning graphics and tables that show patterns of web site usage.

Where to find out about log analysis programs and services

- **Yahoo: Log Analysis Tools**
- **HTTPD Log Analyzers** from NCSA
- **Analysis products** reviewed by Trel -- Commercial Internet Product Finder
- **Web Developer's Virtual Library: Statistics**

Counters - the low impact alternative to log analysis

Counters are so popular that Yahoo devotes a whole page to them. Why are they popular? Mainly because lots of web publishers don't have access to decent log analysis programs so they use counters that are easy to install or available from other organizations for free. For example, both Internet Audit Bureau and Web-Counter offer free and easy to install counters and regular usage reports.

Another reason is to advertise the popularity of a particular site or even a single page. It's shameless, it's fun, and even Piper Resources does it on the State and Local Government on the Net home page. But the White House and Library of Congress don't use counters and neither does Pathfinder (Time Warner), IBM or CNN.

Use counters if you like, but not until you have had enough traffic not to be embarrassed by letting folks know how few people visit your site.

Case Study: Tailoring log analysis software

The log analysis program used on the Piper Resources site is a freeware program called **Analog**. It is a Unix based program written in C and has to be compiled prior to use. As far as I know it has not been ported to other systems.

We tried a number of other programs before selecting Analog. So why did we choose Analog for our log analysis needs?

- It's free but that's not the main reason we choose it.
- It's very fast! Important but not enough.
- It doesn't have to run on the same system as the web server. Very important in our situation.
- It's easy to configure. Bingo!

Our web service provider offers several options for getting information about how our

pages are used. Unfortunately, none are very satisfactory and they are working on it. One of the options is a record of accesses to our pages in common log format. We have to transfer these logs to another system and run the log analysis program from there. After trying about a half dozen programs, each using different programming language from Unix C to Windows Visual Basic we settled on Analog for the reasons listed above. We advocate going with what works!

The October 1995 report for domain traffic on the Piper Resources' site originally looked like this (number of requests, percentage of overall bytes transmitted, and type of domain requesting files):

```
 #reqs :  %bytes : domain
-------  --------  ------
 15077 :  35.04% : .com (USA Commercial)
 10615 :  23.16% : [unresolved numerical addresses]
  7361 :  19.28% : .edu (USA Educational)
  4774 :  10.72% : .net (Network)
  1783 :   4.32% : .gov (USA Government)
  1140 :   3.25% : .us (United States)
   727 :   1.81% : .org (Non-Profit Making Organisations)
   380 :   0.93% : .mil (USA Military)
   111 :   0.26% : .ca (Canada)
```

By adding the following lines to the configuration file, the number of accesses from leading commercial providers becomes clear.

```
SUBDOMAIN aol.com 'America Online'
SUBDOMAIN compuserve.com 'Compuserve'
SUBDOMAIN prodigy.com 'Prodigy'
```

The program now summarizes requests from all America Online sites from the host section of the report and adds the information to the domain section.

Now the report shows that a third of the **.com** requests came from the leading commercial online services in the United States.

```
 #reqs :  %bytes : domain
-------  --------  ------
 15077 :  35.04% : .com (USA Commercial)
(  3421):(   7.86%):     aol.com (America Online)
(  2063):(   5.33%):     compuserve.com (Compuserve)
(   566):(   1.36%):     prodigy.com (Prodigy)
 10615 :  23.16% : [unresolved numerical addresses]
  7361 :  19.28% : .edu (USA Educational)
  4774 :  10.72% : .net (Network)
  1783 :   4.32% : .gov (USA Government)
  1140 :   3.25% : .us (United States)
   727 :   1.81% : .org (Non-Profit Making Organisations)
   380 :   0.93% : .mil (USA Military)
   111 :   0.26% : .ca (Canada)
```

Note: The actual number of hits from these leading commercial sites is most likely under-reported because these providers "cache" pages in order to provide quick access for their users. The files accessed from a "cache" on AOL do not get counted in our statistics.

A glance at the statistics above shows that "unresolved domains" are a problem. Remember that these are sites that do not support reverse domain lookups. They can find us - and they think we can't find them!

While it would not be worth the time to track down every unresolved domain, a **whois** search for hosts that generate a lot of accesses might be useful. For example, the October 1995 Analog report for Piper Resources showed 116 accesses from domain 165.234.109.10. A whois search for 165.234.0.0 showed that the point of origin was the State of North Dakota.

The National Archives - A Model for Reporting Web Site Statistics

CLIO -- The National Archives Information Server (http://www.nara.gov/) also uses Analog for compiling and reporting server statistics. What makes CLIO statistical reporting a model for other government sites are the pages explaining and interpreting the statistics written by webmaster Doug Linder. From the opening page - **CLIO Statistics** - Linder makes it clear that the summaries produced by log analysis programs require interpretation to be useful. His piece on **Interpreting WWW statistics** should be required reading for all webmasters.

It takes more than a good log analysis program to make sense of usage statistics. Linder's **CLIO traffic analysis for September 1995** offers a concise overview of usage and users highlighting the most popular content sought by both external users and NARA staff. It takes only a short time to load and the print copy (only two pages) could easily be circulated by email or used at departmental meetings.

How to set up your web site for log analysis

The following tips may help you obtain more meaningful information from your log analysis programs.

- **Use a logical structure for linking and storing files**

If you map out your site properly from the beginning, you will be less likely to have to move individual files and directories later. A properly organized web site will insure that:

- Users will not be frustrated by not being able to reach one of your files that they bookmarked.
- Network indexes like Lycos will have the correct links for your site.

- Internal links will work properly which might not be the case if you change the structure of your site.

Although most systems can use long file names today, do yourself and your users a favor and employ short but meaningful names for directories and files.

- **Distinguish between content, decorative and navigation graphics.**

Determine which image files you want to count and those you don't and put them in different directories. You don't want to count logos, navigation buttons and bars or most image maps. Most likely you will want to count images of charts, diagrams, maps and tables.

Don't leave the location of critical files up to someone else!

- **Configure the log analysis program to tell you what you want to know.**

Ask your system administrator to tailor the output of the log analysis program to meet your needs. He can still do another run to obtain the statistics he needs for administering the site.

- **Consider purchasing log analysis commercial software.**

The early popularity of the Internet in academic circles led to the development of many fine free programs: servers, clients, search utilities, and even log analysis programs. But the maturing and accompanying commercialization of the Internet has brought with it a competitive environment where software producers offer new and perhaps better products to meet the needs of a changing audience. While many of the commercial packages are very expensive, some cost little more than some of the popular business software commonly found in government offices and should be considered seriously.

Should you make your web statistics public?

Perhaps the question should be: **Why** you should make your usage statistics public?

- **Group effort:** It is a rare government sponsored site that is the work of a single individual. Those who contribute to the site should have easy access to the statistics touching on their areas of responsibility.

- **Agents of change:** An examination of usage statistics may induce

agencies and departments to change, update or modify their pages.

- **Public records:** In most states, log files and other network records are considered public. A good log analysis program will provide access to the most significant data from the logs files.

Note: Some user hosts are actually linked to specific users. For example, johndoe.domain.com and sallysmith.someschool.edu are likely to be the assigned network addresses belonging to John Doe and Sally Smith. Care must be taken to avoid exposing individual user activity to undue public scrutiny. Providing **aggregate** data on a weekly or monthly basis will eliminate this problem.

On the Drawing Board: Proposals for Improving Web Statistics

While it is easy to blame server or client software, the real problem is that the HTTP protocol does not provide adequate support for obtaining the data needed to generate meaningful statistics on how individuals navigate and use the information on a specific site. However, a visit to the World Wide Web Consortium's page on **Demographics on the Web: Overview of Resources** will provide ample proof that available web site statistics are likely to improve significantly in the future.

Although many of the proposals are in early "draft" stages (and thus make for very dense reading), they give a glimpse of what may be in store for web adminstrators and publishers. It is likely that web sessions will go from being independent unrelated events and requests to being part of a linked and authenticated history of user actions. Web clients will be able to act more like user agents -- for very real and specific users. Proposed changes include client-generated:

- Headers that include numeric session and request IDs for each request sent to a web site.
- Permanent user profiles that include name, address and telephone number.

Although electronic commerce is the main impetus for these proposed changes, they could lead to vastly improved data on who uses the web and how they use it. Site adminstrators and individual users would be able to decide how and when to use these improved IDs.

Those involved in creating new standards have a responsibility to protect the privacy of individuals while increasing the utility of the data automatically generated to track usage and profile users.

The World Wide Web Consortium and the Massachusetts Institute of Technology will host a **Workshop on Internet Survey Methodology and Web Demographics**

January 29-30, 1996. It promises to be a rich source of ideas and may influence the future course of web statistical analysis.

Summary

The log analysis program that satisfies your system administrator may not satisfy you! She needs to know whether the system is secure and functioning properly. You can leave that up to her. You want to know what's popular on your pages (and what isn't), who uses your system and how they use it, and how you can improve the service. Some of this information can be found in the log files, but not all of it. Be prepared to conduct online and other types of surveys, ask for feedback from users, fellow workers, potential audiences not yet online, and other webmasters. Publicize your site aggressively. Meanwhile look carefully and critically at other web sites to learn new ways to present and enhance web pages.

Dana Noonan

Reference Links

Background Reading:

- World Wide Web Consortium: Web Demographics
- CASIE (Coalition for Advertiser Supported Information and Entertainment)
  CASIE Guiding Principles of Interactive Media Audience Measurement
- Magazine Publishers of America
  MPA Internet Guidelines
- Newspaper Association of America
  Tracking Audiences on the Web: The Conaghan Report
- GNN NetNews: Beyond "Hits"
- Inter@ctive Week: Race Is On To Track The Web
- Inter@ctive Week: The Rush To Audit Web Traffic
- PC Week: Look Who's Surfing: Tools for qualifying your audience
- WEBsmith: How Popular Is Your Page?
- PBS Frontline: High Stakes in Cyberspace
- NARA: CLIO Statistics

Interpreting WWW statistics

Current Developments

- Demographics on the Web: Overview of resources
- Workshop on Internet Survey Methodology and Web Demographics at MIT
- Advertising Age's interACTIONS - Web Sites and Statistical Authentication Forum

Indexes of Log Analysis and Access Counter Software

- Yahoo: Log Analysis Tools
- Yahoo: Access Counts
- NCSA: HTTPD Log Analyzers
- Stroud's CWSApps List: Web Statistics Services
- Trel: Analysis products
- Web Developer's Virtual Library: Statistics

Commercial Software and Services:

- I/PRO Internet Profiles Corporation
- Internet Audit Bureau - free service
- NetCount (Unix)
- Intersé (PC - Windows)
- SiteTrack (Unix - Netscape servers)
- Web-Counter - free service for low volume sites
  Web-Counter Commercial Services WebReporter (Unix) WebTrac (PC - Windows)
- Webtrack
- WebTrends (PC - Windows)

[Previous Article] – [Next Article]

Issue Index – Search – Write Us – The PIPER Letter – Piper Resources

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URL: http://www.piperinfo.com/piper/pl01/usage.html
Last updated: Sun Jun 02, 1996

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Appendix E - Sailor Operations Center FY 1996 Annual Report

SAILOR OPERATIONS CENTER

400 CATHEDRAL STREET BALTIMORE, MD 21201

FY 1996 ANNUAL REPORT

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STUART RAGLAND	SALIOR HELP DESK MANAGER
AGNES TATARKA	SAILOR DATA ADMINISTRATOR
RUSSELL DOYEN	SAILOR NETWORK TECHNICIAN
LARRY OWENS	SAILOR NETWORK SUPPORT SPECIALIST

SAILOR OPERATIONS CENTER
FY 1996 ANNUAL REPORT

"Sailor levels the playing field... This will enable people to meet their information needs more efficiently and to explore this amazing new means of communication."
- Governor Parris Glendening

OVERVIEW

For the Sailor Operations Center (SOC) staff, FY96 was a year of both goals achieved and new challenges. With the completion of the statewide telecommunications infrastructure, a server to provide access to a growing number of Internet resources, and a help desk staff fielding user questions, Sailor was acknowledged as a critical link in meeting the information needs of the citizens of Maryland.

With this came the challenge of meeting increased demand with more reliable service, enhancements to information access, and responding to users from a growing population of "Internet enlightened" users. SOC staff responded to these challenges by improving reliability, enhancing information resources, and adding end user support on Saturdays.

During the course of the year, staff from the Division of Library Development Services (DLDS) worked closely with SOC staff and provided support and leadership for a variety of Sailor activities statewide.

While the day-to-day management and maintenance of core services remains our primary mission, SOC staffs' expertise was often called on to provide support for projects around the state. These included public library, school, and local government Local Area Network (LAN) and Wide Area Network (WAN) projects, and, with DLDS, the preparation for statewide access to commercial database services. Operations Center staff also followed changes in the telecommunication industry in Maryland and nationally; providing testimony at Public Service Commission hearings involving deregulation and ISDN issues and helping prepare comments for the Federal Communications Commission regarding the Telecommunications Act of 1996.

SOC activities and staff were supported with state, federal and in-kind support. The Enoch Pratt Free Library continued its in-kind support for SOC in FY96 and a growing number of other Sailor sites began adding local monies to enhance Sailor access, e.g., the addition of another T1 by the Montgomery County Department of Public Libraries increasing access from 16 to 39 simultaneous dial in users.

NETWORK SERVICES

In December 1995 Maryland's Governor Parris Glendening spoke at Sailor's "Golden Spike" Ceremony. The event celebrated the completion of a statewide telecommunications network that enables Marylanders in all 24 counties (with the exception of an orphan exchange in Rising Sun) to have toll-free access to Internet resources through Sailor.

Network upgrades and the implementation of monitoring and diagnostic tools resulted in noticeable improvements in network performance. During FY96, Network staff established and maintained a 99.7% network up-time standard, Sailor's Internet connection was upgraded from a T1 1.45Mbits per second circuit to a fiber-optic 4Mbits per second T3 SMDS, and several sites upgraded to access to 28.8K dial-up access.

In addition, the Sailor backbone was used to facilitate Internet access for the Maryland Electronic Capital (MEC) project and the Maryland Archives and Annapolis Fiber Ring. Several county-level initiatives are underway to connect schools and government agencies to the Sailor backbone.

INFORMATION SERVICES

The Sailor web site celebrated its first anniversary in June 1996. Much of the first half of the fiscal year was spent developing and implementing core services and web management tools: search engine, statistics program, and link checker. Improved and enhanced services include:

- modification of the Lynx web browser software to provide users of the guest account access to go to a known gopher or web site by typing the URL
- software upgrades to provide field-level searching of many of the locally-mounted databases
- installation of the Harvest search software to provide indexing and searching of all Maryland library web sites

The Sailor web site has grown to include around 350 local mounted files and links to around 1000 other Internet resources. The volunteer Topical Area Reviewer teams have taken on the task of reorganizing and broadening the subject areas, as well as providing reviews of Internet resources.

Sailor is also hosting several new information resources including the:

- General Assembly of Maryland - Committee Meetings and Hearing Schedule (updated weekly)
- Directory of Services for Children and Youth from the Governor's Office for Children, Youth and Families
- Homeless Resource Manual
- Inventory of African American Historical and Cultural Resources in Maryland

ENDUSER SUPPORT

The Help Desk staff of 3 FTE (provided as part of the Pratt Library's in-kind support of Sailor) respond to telephone and e-mail requests for assistance with, and information about, the Sailor Network, Sailor servers, and Internet account services hosted at the Pratt. These services are provided to a state-wide customer base, including librarians, government employees, businesspersons, and the citizens of the State of Maryland. One of the Pratt FTEs is shared with the SOC as its administrative assistant. Saturday coverage was added in November 1995.

User response to the "open GoTo" option in Lynx has been positive and many have taken the time to use the feedback form to note the improvements in network performance. One user writes "I sincerely appreciate what has been done to improve the availability and other dimensions of the Sailor service over the past year."

INFORMATION & LEADERSHIP

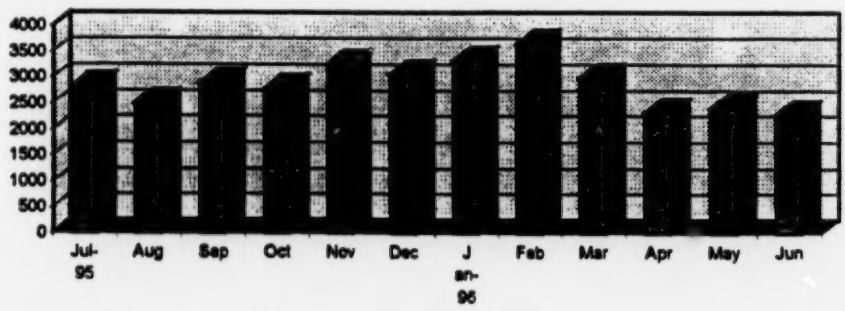
SOC continued to host the meetings of the Sailor Network Managers Group (SNMG). These bi-monthly gatherings provided a forum for discussion and dissemination of information concerning LAN/WAN and Internet technologies. An Internet-connected computer was used to demonstrate the use of applications such as teleconferencing over the Sailor backbone. In addition, Sailor hosted an electronic mailing list for this group.

Throughout the year, SOC staff regularly attended meetings of the Sailor Navigators, the Network Coordinating Council, MAPLA, the Information Technology Board, and the Maryland Governments Internet Users Group.

STATISTICS

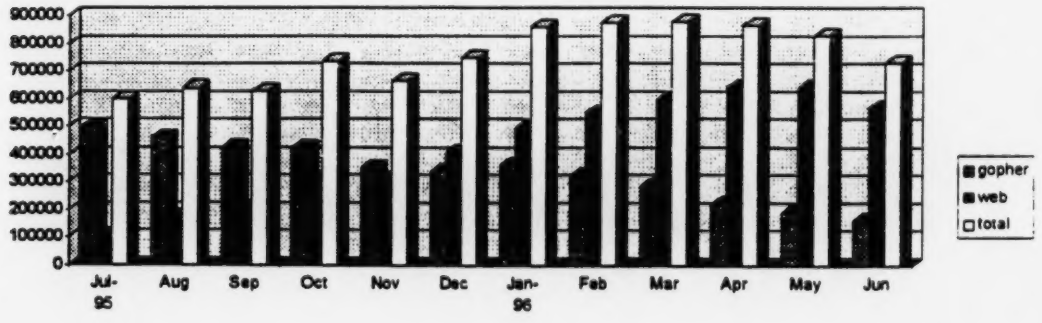
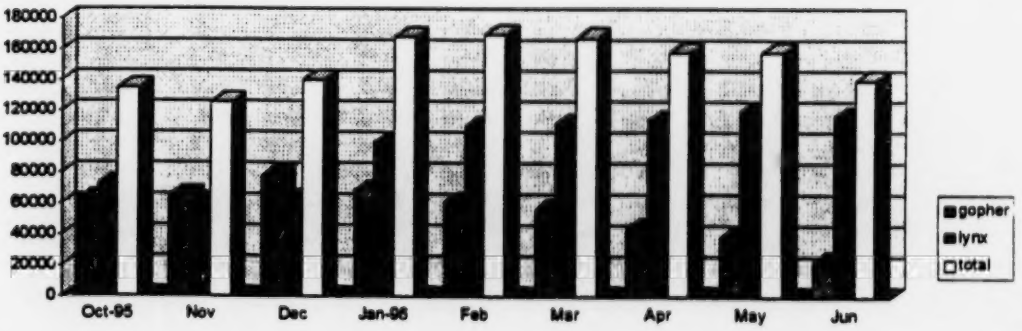
The Sailor Help Desk responded to 34,367 telephone and e-mail requests for assistance and information during FY96. This represents a 56% increase in contacts over FY95's 22,029 contacts.

HELP DESK CONTACTS



Sailor server logs for this 12-month period show a total of 9,039,963 requests, giving a monthly average of 753,330. Slight declines are seen as weather improves and schools begin their summer breaks. Guest logins show a similar decline beginning in April.

SAILOR SERVER REQUESTS



SAILOR GUEST LOGINS